United States Department of Agriculture

Soil Conservation Service

In cooperation with Purdue University Agricultural Experiment Station and Indiana Department of Natural Resources, Soil and Water Conservation Committee

Soil Survey of Franklin County, Indiana

How To Use This Soil Survey

General Soil Map

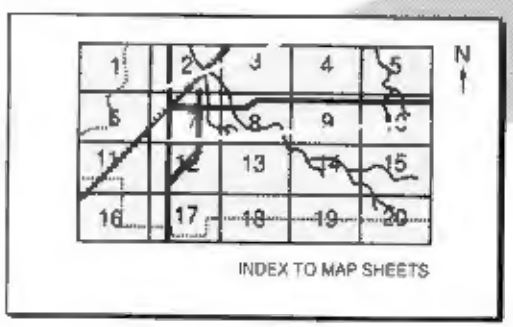
The general soil map, which is the color map preceding the detailed soil maps, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

Detailed Soil Maps

The detailed soil maps follow the general soil map. These maps can be useful in planning the use and management of small areas.

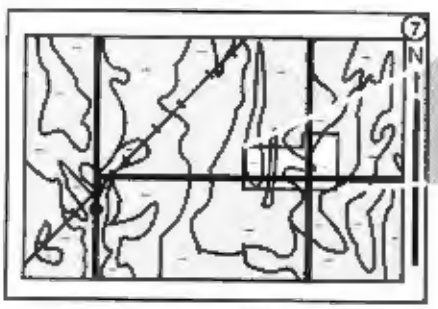
To find information about your area of interest, locate that area on the **Index to Map Sheets**, which precedes the soil maps. Note the number of the map sheet, and turn to that sheet.



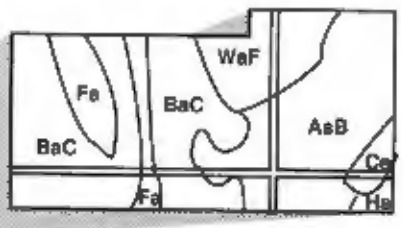
INDEX TO MAP SHEETS

MAP SHEET

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Turn to the **Index to Map Units** (see Contents), which lists the map units by symbol and name and shows the page where each map unit is described.



MAP SHEET



AREA OF INTEREST

NOTE: Map unit symbols in a soil survey may consist only of numbers or letters, or they may be a combination of numbers and letters.

The **Summary of Tables** shows which table has data on a specific land use for each detailed soil map unit. See **Contents** for sections of this publication that may address your specific needs.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, handicap, or age.

Major fieldwork for this soil survey was completed in 1983. Soil names and descriptions were approved in 1984. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1983. This survey was made cooperatively by the Soil Conservation Service, the Purdue University Agricultural Experiment Station, and the Indiana Department of Natural Resources, Soil and Water Conservation Committee. It is part of the technical assistance furnished to the Franklin County Soil and Water Conservation District. Financial assistance was made available by the Franklin County Commissioners.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Riprapped stream in an area of Wirt soils.

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Soil Series

Issued September 1989

Index to Map Units

Summary of Tables

Foreword

This soil survey contains information that can be used in land-planning programs in Franklin County. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Robert L. Eddleman
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Location of Franklin County in Indiana.

Soil Survey of Franklin County, Indiana

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Fieldwork by Jerold L. Shively, Soil Conservation Service,
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of Natural Resources, Soil and Water Conservation Committee

United States Department of Agriculture, Soil Conservation Service
in cooperation with
Purdue University Agricultural Experiment Station
and Indiana Department of Natural Resources,
Soil and Water Conservation Committee

FRANKLIN COUNTY is 65 miles east-southeast of Indianapolis (see map on facing page). The county is about 250,176 acres, or 391 square miles. Nearly 5,700 acres, most of which is around Brookville Lake, is owned by the United States Government. In 1980, Franklin County had a population of 19,612, 18.1 percent of whom were urban residents living on about 1 percent of the land. In the past 50 years, the population has increased by about 35 percent (*10*). Brookville, the county seat, is near the center of the county. The other major towns are Batesville-Huntersville, Laurel, and Oldenburg.

The present boundaries of the county were set in 1811 around land ceded to the United States Government by the Miami, Pottowatomi, Wea, and Delaware Indians in four grants. The earliest settlers in the county were English, Scotch, and Irish immigrants who originally settled in the Carolinas, Pennsylvania, New Jersey, and New York. In the 1830's, German immigrants settled the highlands south of the Whitewater River.

This soil survey is an update of a soil survey of Franklin County issued in 1950 (*8*). It provides additional information and maps that show the soils in greater detail.

General Nature of the County

This section gives information about features that affect the use of the soils in Franklin County.

Natural Resources

Abundant quantities of high-quality sand and gravel for building materials and roads are in the Whitewater River Valley. Limestone, used for building purposes and agricultural lime, is quarried in the northwest part of the county. Two of the main sources of water are the sand and gravel deposits of the Whitewater River Valley and the Brookville Reservoir.

Relief and Drainage

The lowest point in Franklin County, about 525 feet above sea level, is in the Whitewater River, in an area near New Trenton. The highest points, about 1,070 feet above sea level, are in Andersonville and a mile north of Andersonville. The area north of the Whitewater River is generally gently undulating or hummocky. Some nearly level areas, smoothed by the Wisconsin-age glaciers, are near Bath. The area south of the Whitewater River Valley is dominated by flat ridgetops and by side slopes which are steeper as one moves downslope from the ridgetop. Most of the Whitewater River Valley wall is a

conspicuously smooth slope that drops 200 to 300 feet to the distinctly benched terraces and flood plains of the Whitewater River, the steepest-gradient river in Indiana.

Most of the county is drained by the Whitewater River. The runoff in the southwest part of Ray Township flows south to Laughery Creek, and that in parts of Bath, Springfield, and Whitewater Townships flows east to Indian Creek. In most areas the direction of the runoff is quite evident. Glaciers were able to cover the bedrock in all areas, except for the hillsides along the Whitewater River and its tributaries and the valleys of Indian Creek.

Water Supplies

Wells in the Whitewater River Valley aquifers provide water for domestic and manufacturing needs. Public and private utilities supply 33.5 percent of the water used. The Brookville system furnishes water north of the river and to the east. Individual wells supply about 50.5 percent of the households (*4*). Adequate water is difficult to find outside the river valleys and Lake Brookville.

Transportation Facilities

About 30 percent of the roads in the county are paved, and nearly all are all-weather roads (*4*). U.S. Route 52 crosses the county in a northwest-southeast direction. Interstate 74, which connects Indianapolis and Cincinnati, serves the Huntersville-Batesville area. State Roads 1, 101, 121, and 229 serve north-south traffic. State Road 252 serves east-west traffic east of Brookville (fig. 1). The Indiana and Ohio Railroad connects Brookville traffic to the Cincinnati rail system. The Whitewater Valley Railroad serves the Metamora and Laurel tourist market.

Farming

About 14 percent of the residents of Franklin County are farmers. In 1978, there were 168,030 acres spread among 1,032 farms. The major uses of that acreage were cropland (104,287 acres), woodland (35,535 acres), and pasture (16,412 acres). About two-thirds of the cropland is used for corn, a quarter for soybeans, and the rest mainly for wheat and hay. Tobacco was grown on 432 acres.

During 1978, about 63 percent of the agricultural sales in the county were from livestock and poultry, most of which were fed locally grown feed. There were about 20,000 head of cattle, 60,000 hogs, and 80,000 chickens in the county (*9*).

Industry

Enterprises that manufacture rubber and plastic extrusions and roofing material are the main nonfarm industries in the county. Many small operations mine and sell building stone. The woodland in the county is a base for such activities as pallet manufacturing and lumber production. Grain terminals, fertilizer suppliers, farm equipment dealers, and sawmills are some of the farm-related industries.

Climate

Prepared by the National Climatic Center, Asheville, North Carolina.

Table 1 gives data on temperature and precipitation for the survey area as recorded at Brookville in the period 1951 to 1974. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on length of the growing season.

In winter the average temperature is 30 degrees F, and the average daily minimum temperature is 20 degrees. The lowest temperature on record, which occurred at Brookville on February 3, 1951, is -22 degrees. In summer the average temperature is 72 degrees, and the average daily maximum temperature is 84 degrees. The highest recorded temperature, which occurred at Brookville on September 1, 1951, is 104 degrees.

Growing degree days are shown in table 1. They are equivalent to "heat units." During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (40 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The total annual precipitation is 39.46 inches. Of this, nearly 23 inches, or about 60 percent, usually falls in April through September. The growing season for most crops falls within this period. In 2 years out of 10, the rainfall in April through September is less than 18 inches. The heaviest 1-day rainfall during the period of record was 4.3 inches at Brookville on July 1, 1973. Thunderstorms occur on about 45 days each year. Tornadoes and severe thunderstorms occur occasionally. These storms are usually local in extent and of short duration and cause damage in scattered areas.

The average seasonal snowfall is about 17 inches. The greatest snow depth at any one time during the period of record was 12 inches. On the average, 12 days of the year have at least 1 inch of snow on the ground. The number of such days varies greatly from year to year.

The average relative humidity in midafternoon is about 60 percent. Humidity is higher at night, and the average at dawn is about 80 percent. The sun shines 70 percent of the time possible in summer and 40 percent in winter. The prevailing wind is from the south-southwest. Average windspeed is highest, 12 miles per hour, in spring.

Figure 1.—Road 252 in an area of Eden soils.

How This Survey Was Made

This survey was made to provide information about the soils in the survey area. The information includes a description of the soils and their location and a discussion of the suitability, limitations, and management of the soils for specified uses. Soil scientists observed the steepness, length, and shape of slopes; the general pattern of drainage; the kinds of crops and native plants growing on the soils; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil is associated with a particular kind of landscape or with a segment of the landscape. By observing the soils in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept, or model, of how the soils were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually

change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, acidity, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. The system of taxonomic classification used in the United States is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses under different levels of management. Some interpretations are modified to fit local conditions, and new interpretations sometimes are developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot assure that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Map Unit Composition

A map unit delineation on a soil map represents an area dominated by one major kind of soil or an area dominated by several kinds of soil. A map unit is identified and named according to the taxonomic classification of the dominant soil or soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural objects. In common with other natural objects, they have a characteristic variability in their properties. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of soils of other taxonomic classes. Consequently, every map unit is made up of the soil or soils for which it is named and some soils that belong to other taxonomic classes. These latter soils are called inclusions or included soils.

Most inclusions have properties and behavioral patterns similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting (similar) inclusions. They may or may not be mentioned in the map unit descriptions. Other inclusions, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting (dissimilar) inclusions. They generally occupy small areas and cannot be shown separately on the soil maps because of the scale used in mapping. The inclusions of contrasting soils are mentioned in the map unit descriptions. A few inclusions may not have been observed and consequently are not mentioned in the descriptions, especially where the soil pattern was so complex that it was impractical to make enough observations to identify all of the kinds of soil on the landscape.

The presence of inclusions in a map unit in no way diminishes the usefulness or accuracy of the soil data. The objective of soil mapping is not to delineate pure taxonomic classes of soils but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but onsite investigation is needed to plan for intensive uses in small areas.

General Soil Map Units

The general soil map at the back of this publication shows the soil associations in this survey area. Each association has a distinctive pattern of soils, relief, and drainage. Each is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. It is named for the major soils. The soils making up one association can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one association differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The names, descriptions, and boundaries of the soils on the general soil map of this county do not always match or join fully with those of the soils on the maps of adjoining counties published at an earlier date. Some differences are the result of changes in concepts of soil series or of variations in the extent of soils in associations made up of two or three series. Other differences result from the range in slope allowed in the associations.

Soil Descriptions

1. Gessie-Moundhaven Association

Deep, nearly level, well drained and somewhat excessively drained, loamy soils formed in alluvium; on flood plains

These soils are on flood plains consisting of low, old, filled stream channels and the flat, interfluvial areas in stream valleys. The size of the areas is moderate along the Whitewater River and small along tributaries and minor streams.

This association makes up about 4 percent of the county. It is about 63 percent Gessie soils, 26 percent Moundhaven soils, and 11 percent minor soils.

The Gessie soils are well drained. They have a high available water capacity. Typically, the surface layer is dark brown loam about 10 inches thick. The part of the substratum to a depth of 44 inches is dark yellowish brown silt loam and loam. The part between depths of 44 and 60 inches or more is yellowish brown loamy coarse sand.

The Moundhaven soils are somewhat excessively drained. They have a low available water capacity. Typically, the surface layer is brown sandy loam about 14 inches thick. The substratum to a depth of 60 inches is stratified dark yellowish brown, yellowish brown, and light yellowish brown loamy sand and sand having strata of sandy loam and silt loam.

The minor soils are well drained Wirt soils along major tributary channels, moderately well drained Oldenburg soils away from the channel of major tributaries, and well drained Dearborn soils along drainageways extending into the residual uplands.

This association is used mostly for cultivated crops. Some areas are used for tobacco. Some small, odd-shaped areas are used as woodland or pasture. Flooding is the major hazard, but some areas are protected and some areas along the upper reaches of steep-gradient streams are rarely, if ever, flooded.

This association is well suited to cultivated crops and woodland. It is generally unsuitable for urban and residential uses because of a severe hazard of flooding on the unprotected and lower parts of the flood plains. The retention of excess water in the Brookville Reservoir has reduced much of the flooding hazard below the dam. The association is suited to tobacco. It has enough moisture and water for irrigation to make it well suited to vegetable crops.

2. Ockley-Eldean-Alvin Association

Nearly level and gently sloping, well drained, loamy soils that are deep and moderately deep to sand and gravel and that formed in outwash; on river terraces

These soils are on river terraces that are characterized by a long and narrow, swell-and-swale topography and sloping areas along drainageways. The Ockley and Eldean soils are on the higher terraces, and the Alvin soils are on the lower terraces. All those soils have a moderate available water capacity.

This association makes up about 3 percent of the county. It is about 25 percent Ockley soils, 24 percent Eldean soils, 18 percent Alvin soils, and 33 percent minor soils.

The Ockley soils are deep to sand and gravel. Typically, the surface layer is dark brown loam about 12

inches thick. The subsoil is about 34 inches thick. It is yellowish brown clay loam in the upper part, dark yellowish brown clay loam in the next part, and dark yellowish brown and dark brown gravelly clay loam in the lower part. The part of the substratum between depths of 46 and 54 inches is yellowish brown gravelly loamy coarse sand. The part from a depth of 54 to 60 inches or more is brown gravelly coarse sand that has lenses of coarse sand.

The Eldean soils are moderately deep to sand and gravel. Typically, the surface layer is brown loam about 8 inches thick. The subsoil is dark brown and is about 22 inches thick. It is clay loam, gravelly clay, and gravelly sandy clay loam. The part of the substratum between depths of 30 and 36 inches is pale brown gravelly coarse sandy loam. The part from a depth of 36 to 60 inches or more is pale brown very gravelly coarse sand.

The Alvin soils are deep to sand. Typically, the surface layer is dark brown sandy loam about 10 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, friable loam in the upper part, yellowish brown loam in the next part, and yellowish brown fine sandy loam in the lower part. The substratum to a depth of 60 inches or more is light yellowish brown loamy fine sand.

The minor soils are well drained Fox soils on moderately sloping side slopes on short breaks, well drained Dearborn soils in drainageways on foot slopes of the higher adjacent uplands, excessively drained Rodman soils on the very steep breaks between the terraces and the bottom land, and very poorly drained Milford soils in swales below short, steep breaks.

This association is used mostly for cultivated crops. Some areas are used for tobacco. The association is suitable for urban and residential uses. It is well suited to cultivated crops, but the moderate available water capacity is a limitation and erosion is a hazard. The amount of ground water is adequate for irrigation. The association is well suited to tobacco. It is well suited to summer annual crops because water is available for irrigation.

3. Eden-Carmel Association

Moderately deep and deep, very steep to moderately sloping, well drained, clayey and silty soils formed in residuum, on uplands

These soils are on long side slopes on uplands above terraces and flood plains and their drainageways.

This association makes about 19 percent of the county. It is about 70 percent Eden soils, 10 percent Carmel soils, and 20 percent minor soils.

The Eden soils are on hillsides. They have a low available water capacity. Typically, the surface layer is very dark grayish brown very flaggy silty clay about 2 inches thick. The subsoil is about 21 inches thick. It is brown very flaggy silty clay and clay in the upper part and light olive brown flaggy silty clay in the lower part. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 23 inches. They limit root penetration.

The Carmel soils are on the upper hillsides and narrow ridgetops. They have a moderate available water capacity. Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 36 inches thick. It is yellowish brown silty clay loam and silty clay. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 42 inches. They limit root penetration.

The minor soils are well drained Dearborn soils along drainageways, well drained Woolper soils on toe slopes, and well drained Hennepin soils on hillsides.

This association is used mostly for hardwoods. Some areas are used for pasture. Tobacco is grown in some areas of the minor Dearborn and Woolper soils. It is not grown on the major soils because of the hazard of erosion and a high content of clay.

Erosion, slope, and the high clay content are the major problems affecting most uses. Slope limits the use of equipment. The association is poorly suited to cultivated crops and hay and is only fairly well suited to woodland and pasture because of the slope of both the major soils and the low available water capacity in the Eden soils. The major soils are poorly suited to summer annual vegetable crops such as tomatoes. They are poorly suited to urban development because of slope, slow permeability, and the content of clay. They are subject to slippage when saturated.

4. Avonburg-Cobbsfork Association

Deep, nearly level, somewhat poorly drained and poorly drained, silty soils formed in loess and underlying glacial drift, on uplands

These soils are on large, broad glacial till plains that are characterized by a gradual swell-and-swale topography.

This association makes up about 8 percent of the county. It is about 63 percent Avonburg soils, 33 percent Cobbsfork soils, and 4 percent minor soils.

The Avonburg soils are somewhat poorly drained. They are on broad flats. These soils have a fragipan, which limits root penetration and water movement. They have a moderate available water capacity. Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil extends to a depth of 80 inches or more. It is grayish brown and yellowish brown, mottled silty clay loam in the upper part, a fragipan of yellowish brown, mottled silty clay loam and silt loam in the next part, and yellowish brown, mottled silt loam in the lower part.

The Cobbsfork soils are poorly drained. They are in the large, broad swales and at the center of broad swells. They have a high available water capacity. Typically, the surface layer is gray, mottled silt loam

about 13 inches thick. The subsurface layer is also gray, mottled silt loam. It is about 8 inches thick. The subsoil extends to a depth of 80 inches or more. It is light brownish gray, mottled silt loam and silty clay loam in the upper part and yellowish brown, mottled silty clay loam in the lower part.

The minor soils are moderately well drained Rossmoyne soils in gently sloping areas adjacent to small drainageways and somewhat poorly drained colluvial soils along small, narrow drainageways.

This association is used mainly for cultivated crops. Some areas have been drained. Some areas are used as woodland or pasture. Prolonged wetness and the fragipan are the main limitations affecting farming and most other uses. Ponding is prevalent in winter and spring.

This association is fairly well suited to cultivated crops, but wetness and slow permeability are limitations. The association is fairly well suited to woodland, but the wetness is a limitation. The wetness is so severe and so difficult to overcome, particularly on the Cobbsfork soils, that the suitability for residential and other urban uses is poor. Because ponding during the growing season causes sun scalding, the association is poorly suited to tobacco. It is poorly suited to vegetable crops.

5. Cyclone-Fincastle-Reesville Association

Deep, nearly level, poorly drained and somewhat poorly drained, silty soils formed in loess and underlying glacial till; on uplands

These soils are on glacial till plains characterized by a swell-and-swale topography.

This association makes up about 4 percent of the county. It is about 42 percent Cyclone soils, 34 percent Fincastle soils, 20 percent Reesville soils, and 4 percent minor soils.

The Cyclone soils are poorly drained. They are in depressions. They have a high available water capacity. Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is very dark gray, mottled silt loam about 7 inches thick. The subsoil is mottled and is about 40 inches thick. It is gray silty clay loam in the upper part, yellowish brown silt loam in the next part, and yellowish brown loam in the lower part. The substratum to a depth of 65 inches or more is yellowish brown, mottled loam.

The Fincastle soils are somewhat poorly drained. They are on large, broad flats. Available water capacity is high. Typically, the surface layer is dark yellowish brown silt loam about 11 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 34 inches thick. It is yellowish brown, mottled silty clay loam, silt loam, and loam. The substratum to a depth of 60 inches or more is brown loam.

The Reesville soils are somewhat poorly drained. They are on large, broad flats. Available water capacity is high. Typically, the surface layer is dark grayish brown silt loam about 10 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 39 inches thick. It is yellowish brown, mottled silt loam, silty clay loam, and silt loam. The part of the substratum between depths of 52 and 56 inches is yellowish brown, mottled silt loam. The part from a depth of 56 to 60 inches or more is yellowish brown, mottled loam.

The minor soils are very poorly drained Milford soils in large swales.

This association is used almost entirely for cultivated crops. A few areas are used as woodland or pasture. Wetness is the major limitation. Ponding is common in winter and spring on the Cyclone soils. Most areas are adequately drained by subsurface drainage systems.

If drained, the major soils are well suited to cultivated crops. They are fairly well suited to woodland. Wetness is so severe that the suitability for residential and urban uses is poor. The soils are poorly suited to tobacco because of ponding during the growing season, which causes sun scalding. The soils are poorly suited to vegetable crops because of wetness.

6. Fincastle-Xenia-Cyclone Association

Deep, nearly level and gently sloping, moderately well drained to poorly drained, silty soils formed in loess and underlying glacial till; on uplands

These soils are on glacial till plains that are characterized by a swell-and-swale topography.

This association makes up about 9 percent of the county. It is about 58 percent Fincastle soils, 20 percent Xenia soils, 17 percent Cyclone soils, and 5 percent minor soils.

The Fincastle soils are somewhat poorly drained. They are on very gently sloping, large flats. They have a high available water capacity. Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled silt loam about 4 inches thick. The subsoil is about 38 inches thick. It is yellowish brown, mottled silty clay loam, silt loam, and loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled loam.

The Xenia soils are moderately well drained. They are on nearly level and gently sloping ridgetops and side slopes. They have a high available water capacity. Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, mottled silty clay loam in the upper part, yellowish brown clay loam in the next part, and yellowish brown, mottled loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam.

The Cyclone soils are poorly drained. They are in depressions. They have a high available water capacity. Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is very

dark gray, mottled silt loam about 7 inches thick. The subsoil is about 40 inches thick. It is gray, mottled silty clay loam in the upper part, yellowish brown, mottled silt loam in the next part, and yellowish brown, mottled loam in the lower part. The substratum to a depth of 65 inches or more is yellowish brown, mottled loam.

The minor soils are moderately well drained Williamstown soils on small swells, well drained Russell soils on prominent swells, and well drained Miami soils on side slopes adjacent to drainageways.

This association is used mostly for cultivated crops. A few areas are used as woodland or pasture. Wetness is the major limitation. Ponding is common in winter and spring on the Cyclone soils. Most areas are adequately drained by subsurface drainage systems. Erosion is a hazard on the gently sloping Fincastle and Xenia soils.

If the soils are adequately drained and erosion is controlled, this association is well suited to cultivated crops and fairly well suited to woodland. Wetness is a severe limitation affecting many residential and urban uses. The suitability for urban development is poor on the Fincastle and Cyclone soils and fair on the Xenia soils. A drainage system is generally needed in areas used for urban development. The association is poorly suited to tobacco because of wetness. It is well suited, fairly well suited, or poorly suited to summer annual vegetables, depending on their tolerance of wetness.

7. Bonnell-Cincinnati-Rossmoyne Association

Deep, nearly level to very steep, well drained and moderately well drained, silty and loamy soils formed in loess and underlying glacial drift and in glacial till; on uplands

This association is on dissected till plains. It makes up about 35 percent of the county. It is about 35 percent Bonnell soils, 32 percent Cincinnati soils, 12 percent Rossmoyne soils, and 21 percent minor soils (fig. 2).

The Bonnell soils are well drained. They are on moderately sloping to very steep hillsides and side slopes. These soils formed in glacial till and in some areas have a thin mantle of loess. Root penetration and

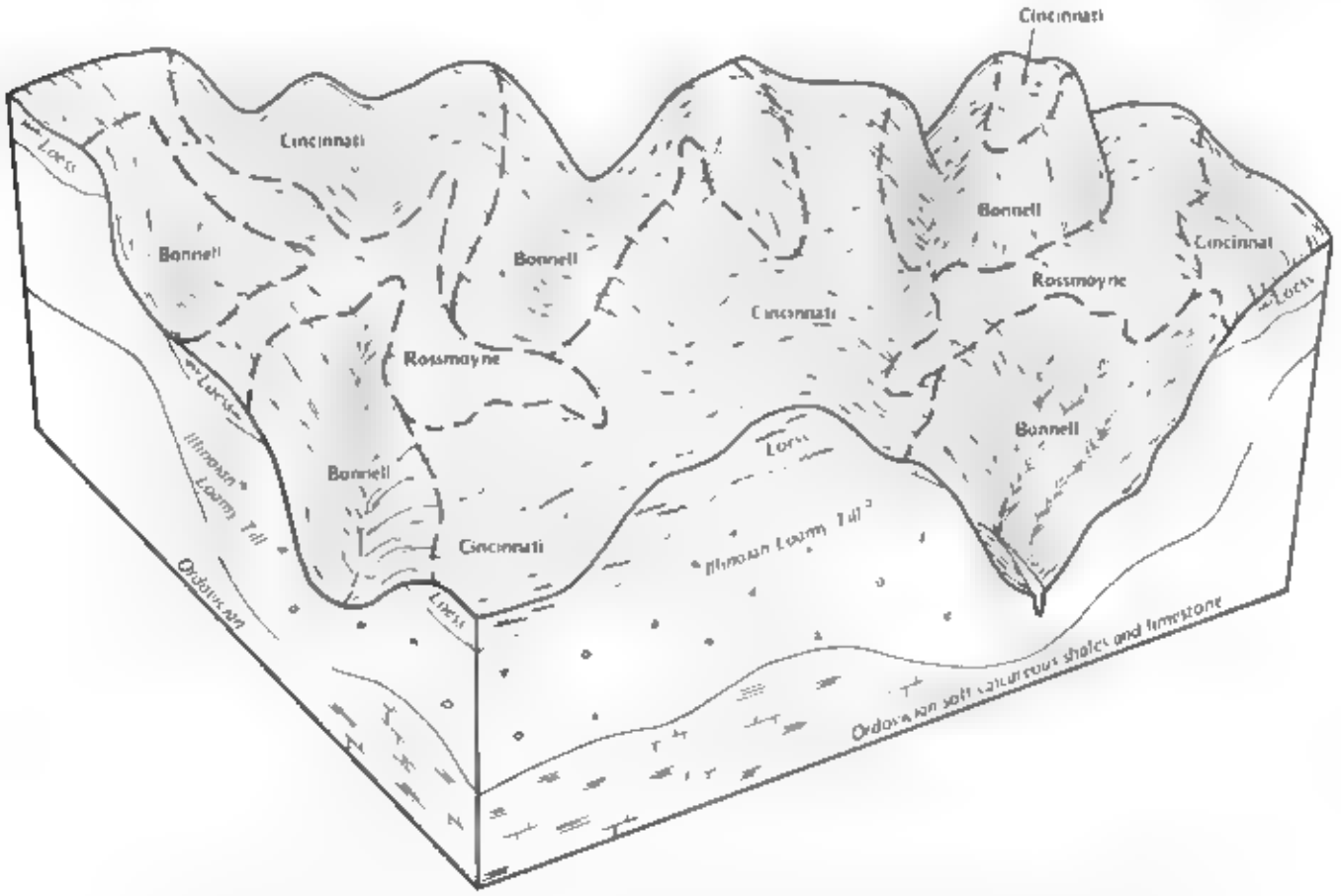

Figure 2.—Typical pattern of soils and parent material in the Bonnell-Cincinnati-Rossmoyne association.

water movement are good throughout the profile Available water capacity is high or moderate. Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 44 inches thick. It is yellowish brown clay, clay loam, and loam. The substratum to a depth of 60 inches or more is yellowish brown loam.

The Cincinnati soils are well drained. They are on narrow side slopes and ridgetops. These soils formed in loess and the underlying glacial drift and glacial till. They have a fragipan, which limits root penetration and water movement. They mainly have a moderate available water capacity, but in severely eroded areas the available water capacity is low. Typically, the surface layer is brown silt loam about 7 inches thick. It has specks of yellowish brown material from the subsoil. The subsoil extends to a depth of 80 inches or more. It is yellowish brown silty clay loam in the upper part, a fragipan of brown and yellowish brown silt loam and loam in the next part, and yellowish brown clay loam in the lower part.

The Rossmoyne soils are moderately well drained. They are on side slopes and ridgetops. These soils formed in loess and the underlying glacial drift and glacial till. They have a fragipan, which limits root penetration and water movement. They have a moderate available water capacity. Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 68 inches thick. In sequence downward, it is yellowish brown, firm silt loam; yellowish brown, mottled silty clay loam; a fragipan of brown and yellowish brown silty clay loam, silt loam, and clay loam; and yellowish brown clay loam. The substratum to a depth of 80 inches or more is yellowish brown clay loam.

The minor soils are the somewhat poorly drained Avonburg soils on nearly level ridgetops and at the head of drainageways, well drained Edenton soils on hillsides, and well drained Carmel soils on nose slopes. The Edenton soils are underlain by soft, calcareous shale and limestone

This association is used for cultivated crops, pasture and hay, or woodland. Erosion is the main hazard. The fragipan is the major limitation in the Cincinnati and Rossmoyne soils. Wetness is a limitation because water stays on top of the fragipan during wet periods.

The gently sloping soils are well suited to cultivated crops, but the fragipan is a limitation. These more sloping soils are poorly suited to cultivated crops because of the hazard of erosion. The association is well suited to hay, pasture, and woodland and is fairly well suited to tobacco and specialty crops, but the fragipan in the Cincinnati and Rossmoyne soils limits root penetration and the available water capacity. The association is poorly suited to most residential and urban uses, mainly because of the slope and restricted permeability

8. Miami-Xenia-Russell Association

Deep, nearly level to strongly sloping, well drained and moderately well drained, silty and loamy soils formed in loess and underlying glacial till; on uplands

These soils are on dissected glacial till plains. They are on large, hummocky swells adjacent to large stream valleys.

This association makes up about 18 percent of the county It is about 46 percent Miami soils, 19 percent Xenia soils, 15 percent Russell soils, and 20 percent minor soils (fig. 3)

The Miami soils are well drained. They are on gently sloping to strongly sloping hillsides and ridgetops. Available water capacity is high. Typically, the surface layer is brown silt loam about 8 inches thick. It has specks of yellowish brown material from the subsoil. The subsoil is about 26 inches thick. It is yellowish brown, firm clay loam in the upper part and brown, firm loam in the lower part. The substratum to a depth of 60 inches or more is pale brown loam.

The Xenia soils are moderately well drained. They are in nearly level or gently sloping areas on ridgetops and side slopes and at the head of drainageways. Available water capacity is high. Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, mottled, firm silty clay loam in the upper part, yellowish brown, firm clay loam in the next part, and yellowish brown, mottled, firm loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam.

The Russell soils are well drained. They are in gently sloping areas on ridgetops and the upper hillsides. Available water capacity is high. Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. It is yellowish brown, firm silty clay loam in the upper part and yellowish brown and brown, firm clay loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam.

The minor soils are moderately well drained Williamstown soils in gently sloping areas on small ridgetops and at the head of drainageways; well drained, moderately deep Wynn soils on gently sloping and moderately sloping hillsides and ridgetops; well drained, moderately deep Eden soils on strongly sloping to very steep side slopes; well drained Hennepin soils on steep or very steep side slopes; somewhat poorly drained Fincastle soils in swales along drainageways; and somewhat poorly drained soils and moderately well drained colluvial soils in drainageways.

About half of this association is used for cultivated crops. The rest is used for woodland, pasture, or hay Erosion is the major hazard affecting most uses, especially intensive cultivation. Slope limits the use of equipment in many areas.

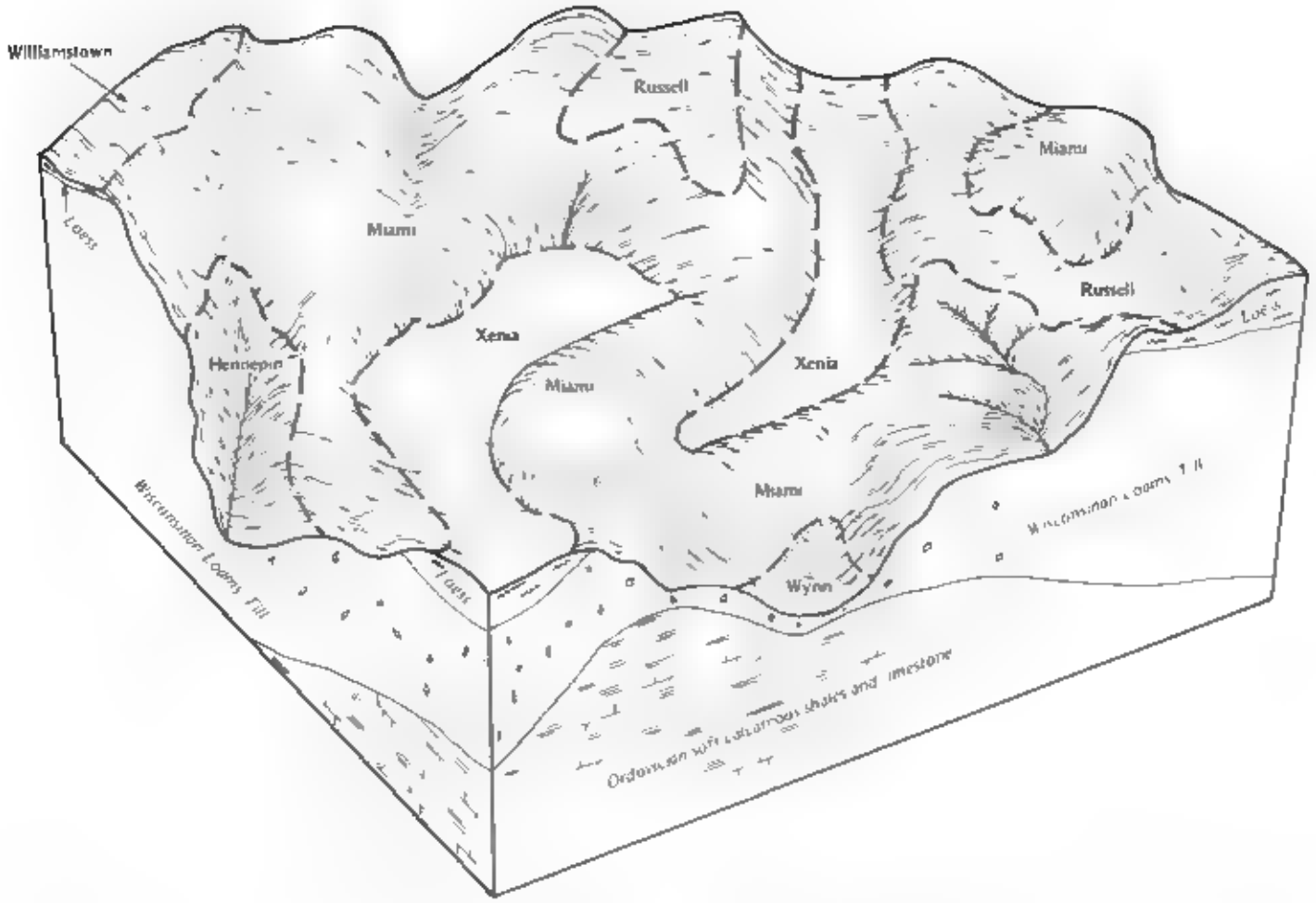

Figure 3.—Typical pattern of soils and parent material in the Miami-Xenia-Russell association.

Because of the hazard of erosion and the slope, this association is only fairly well suited to cultivated crops in gently sloping areas and is poorly suited in the steeper areas. It is well suited to woodland. The steeper soils are poorly suited to most residential or urban uses, and the less sloping soils are fairly well suited or well suited. The nearly level to moderately sloping soils are well suited to tobacco. The association is suitable for vegetable crops.

Detailed Soil Map Units

The map units on the detailed soil maps at the back of this survey represent the soils in the survey area. The map unit descriptions in this section, along with the soil maps, can be used to determine the suitability and potential of a soil for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit, or soil, is given under "Use and Management of the Soils."

Each map unit on the detailed soil maps represents an area on the landscape and consists of one or more soils for which the unit is named.

A symbol identifying the soil precedes the map unit name in the soil descriptions. Each description includes general facts about the soil and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the substratum, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the substratum. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Bonnell clay loam, 12 to 18 percent slopes, severely eroded, is a phase of the Bonnell series.

Some map units are made up of two or more major soils. These map units are called soil complexes. A *soil complex* consists of two or more soils, or one or more soils and a miscellaneous area, in such an intricate pattern or in such small areas that they cannot be shown separately on the soil maps. The pattern and proportion of the soils are somewhat similar in all areas. Fincastle-Reesville silt loam, 0 to 1 percent slopes, is an example of a complex.

Most map units include small scattered areas of soils other than those for which the map unit is named. Some of these included soils have properties that differ substantially from those of the major soil or soils. Such differences could significantly affect use and management of the soils in the map unit. The included soils are identified in each map unit description. Some small areas of strongly contrasting soils are identified by a special symbol on the soil maps.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, quarries, is an example. Miscellaneous areas are shown on the soil maps. Some that are too small to be shown are identified by a special symbol on the soil maps.

The names, descriptions, and boundaries of the soils on the detailed soil maps of this survey area do not always match or join fully with those of the soils on the maps of adjoining counties published at an earlier date. For example, the Cobbsfork soils in this survey were called Clermont soils in earlier surveys. Some differences are the result of changes in concepts of soil series. Other differences result from variations in the extent of the soils or in the slope range allowed in the map units.

Table 4 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils.

Soil Descriptions

AlA—Alvin sandy loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on river terraces. Areas are broad and irregular in shape and are 5 to 70 acres in size. The dominant size is about 30 acres. Slopes are 100 to 200 feet in length.

Typically, the surface layer is dark brown sandy loam about 10 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, friable loam in the upper part; yellowish brown, firm loam in the next part; and yellowish brown, friable fine sandy loam in the lower part. The substratum to a depth of 60 inches or more is light yellowish brown loamy fine sand. In places the subsoil contains gravel or is more clayey. In some other places the substratum has layers of loam or silt loam or is dark brown silty clay in the lower part. In a few areas, the thickness of the surface layer and subsoil is less than 40 inches or the surface layer is very dark grayish brown. The slope in some areas is more than 2 percent.

Included with this soil in mapping are a few sand and gravel pits and areas of colluvial soils along narrow drainageways. Also included are low, rarely flooded

areas. Included soils make up about 10 percent of the map unit.

Available water capacity of this Alvin soil is moderate. Permeability is moderate above the substratum and moderately rapid in the substratum. The organic matter content in the surface layer is low. Surface runoff is slow. The surface layer dominantly is neutral or slightly acid. It is friable and can be tilled throughout a wide range in moisture content. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few areas are wooded.

This soil is well suited to corn, soybeans, tobacco, and small grain. A conservation tillage system that leaves protective amounts of crop residue on the surface and cover crops help to improve tilth and increase the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. The main concern is overgrazing. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the wood and.

This soil has slight limitations as a site for dwellings. It is moderately limited as a site for local roads and streets because of potential frost action. Replacing or covering the subsoil with suitable base material helps prevent the damage caused by frost action. The soil has slight limitations as a site for septic tank absorption fields.

The land capability classification is IIs. The woodland ordination symbol is 4A.

AlB—Alvin sandy loam, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on river terraces. Areas are broad and irregular in shape and are 3 to 40 acres in size. The dominant size is about 15 acres. Slopes are 50 to 250 feet in length.

Typically, the surface layer is dark brown sandy loam about 8 inches thick. The subsoil is about 37 inches thick. It is brown, friable sandy loam in the upper part and dark yellowish brown and yellowish brown, friable sandy loam and loam in the lower part. The part of the substratum between depths of 45 and 57 inches is dark yellowish brown loamy sand. The part from a depth of 57 inches to 60 inches or more is brown sand. In places there is gravel in the subsoil and substratum. In some other places the substratum is silt loam or dark brown silty clay. In a few places the surface layer and subsoil are less than 40 inches thick. The slope in some areas is more than 6 percent or less than 2 percent.

Included with this soil in mapping are a few sand and gravel pits and a few areas of well drained colluvial soils. Also included are low, rarely flooded areas. Included soils make up about 10 percent of the map unit.

Available water capacity in this Alvin soil is moderate. Permeability is moderate above the substratum and moderately rapid in the substratum. The organic matter content in the surface layer is low. Surface runoff from cultivated areas is medium. The surface layer dominantly is neutral or slightly acid. It is friable and can be tilled throughout a wide range in moisture content. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few areas are used for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is the main hazard in cultivated areas. A crop rotation that includes grasses and legumes, contour farming, grassed waterways, and a conservation tillage system that leaves protective amounts of crop residue on the surface help to control erosion. The soil is well suited to no-till farming. Cover crops help to control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. The main concern is overgrazing, which causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil has slight limitations as a site for dwellings. It is moderately limited as a site for local roads and streets because of potential frost action. Replacing or covering the subsoil with suitable base material helps prevent the damage caused by frost action. The soil has slight limitations as a site for septic tank absorption fields.

The land capability classification is IIe. The woodland ordination symbol is 4A.

AvA—Avonburg silt loam, 0 to 2 percent slopes. This nearly level, deep, somewhat poorly drained soil is on broad flats on uplands. Areas are irregular in shape and are 3 to 160 acres in size. The dominant size is about 40 acres. Slopes are 100 to 600 feet in length.

Typically, the surface layer is dark grayish brown silt loam about 8 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick.

The subsoil extends to a depth of 60 inches or more. It is grayish brown and yellowish brown, mottled, firm silty clay loam in the upper part; a fragipan of yellowish brown, mottled, very firm, brittle silty clay loam and silt loam in the next part; and yellowish brown, mottled, firm silt loam in the lower part. In many areas the soil has up to 60 inches of loess. In places it is on low stream terraces and is stratified in the substratum. The slope in some areas is more than 2 percent.

Included with this soil in mapping are small areas of poorly drained Cobbsfork soils on broad flats and moderately well drained Rossmoyne soils along drainageways. Included soils make up about 8 percent of the map unit.

Available water capacity of this Avonburg soil is moderate. Permeability is moderate above the fragipan and very slow in the fragipan. The organic matter content of the surface layer is moderately low. Surface water runoff is slow in cultivated areas. The soil has a water table at a depth of 1 to 3 feet during late winter and early spring. Root growth is limited by the fragipan. The surface layer is dominantly very strongly acid if unlimed and is neutral or slightly acid if limed. It is friable and can be tilled throughout a fairly wide range in moisture content.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, wheat, and tobacco. Wetness and the fragipan are major limitations. The fragipan limits rooting depth and water movement. Water on the surface causes a hazard of sun scalding to tobacco. A surface drainage system is generally needed to remove excess surface water. Silt seals subsurface drains after a few years. A conservation tillage system that leaves protective amounts of crop residue on the surface and cover crops help to maintain the organic matter content and good tilth.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. It is poorly suited to deep-rooted legumes because of the dense fragipan. It is suited to shallow-rooted grasses and legumes that are tolerant of a seasonal high water table. The major pasture management concerns are overgrazing and grazing when the soil is too wet, which causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Seedling mortality, windthrow, and plant competition are the main concerns. Seedlings survive and grow well if competing vegetation is controlled by special harvesting methods, by site preparation, and by spraying, cutting, or girdling. The fragipan limits rooting depth and causes windthrow. Harvesting methods that do not leave trees standing alone or widely spaced will reduce windthrow. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings because of wetness. Using subsurface drains and placing buildings on raised, well compacted fill material can help overcome the wetness. The soil is severely limited as a site for local roads and streets because of low strength and potential frost action. Constructing the roads on raised, well compacted fill material and providing adequate side ditches and culverts will help prevent frost damage. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of wetness and the very slow permeability. Interceptor drains around the perimeter of the absorption field can help lower the water table. Filling or mounding the absorption field with suitable material and elevating the field will help minimize the permeability problem.

The land capability classification is IIw. The woodland ordination symbol is 4D.

BnF—Bonnell loam, 25 to 50 percent slopes. This steep and very steep, deep, well drained soil is on hillsides on uplands. Areas are long and narrow and are 4 to 35 acres in size. The dominant size is about 15 acres. Slopes range from 50 to 200 feet in length.

Typically, the surface layer is dark brown loam about 2 inches thick. The subsurface layer is brown loam about 4 inches thick. The subsoil is about 42 inches thick. It is brown, friable loam in the upper part and yellowish brown, firm clay loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam. In places the surface soil and subsoil are more than 50 inches thick. In some other places the subsoil is more clayey. The slope in some areas is less than 25 percent.

Available water capacity in this Bonnell soil is moderate. Permeability is slow. The organic matter content is moderately low. Surface runoff is very rapid. The surface layer is dominantly strongly acid and is friable. The shrink-swell potential is moderate.

Most areas are used as woodland. This soil is generally unsuited to cultivated crops because of the slope and a severe hazard of erosion.

This soil is poorly suited to grasses and legumes for pasture. It is unsuited to hay because the slopes limit the use of most types of farm equipment. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Slope limits the use of equipment, and erosion is a major hazard. Roads are slippery and easily rutted when the soil is wet. Placing roads, skid trails, and landings on gentle grades and removing water with water bars, culverts, and drop

structures help to control erosion. Seedlings survive and grow well if competing vegetation and erosion are controlled. Site preparation or spraying, cutting, or girdling unwanted trees and shrubs controls competing vegetation. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings because of the slope and the shrink-swell potential. It is severely limited as a site for local roads because of the shrink-swell potential, low strength, and the slope. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. Constructing local roads on the contour and land shaping help to overcome the slope. The soil is generally unsuitable as a site for septic tank absorption fields because of the slow permeability and the slope.

The land capability classification is VIIe. The woodland ordination symbol is 4R.

BoC2—Bonnell silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on side slopes and narrow ridgetops on uplands. Areas are long and narrow and are 5 to 50 acres in size. The dominant size is about 15 acres. Slopes range from 50 to 200 feet in length.

Typically, the surface layer is dark brown silt loam about 7 inches thick. It has specks of yellowish brown silty clay loam. The subsoil is about 58 inches thick. The upper part is yellowish brown, firm silty clay loam, and the lower part is yellowish brown, brown, and strong brown, firm clay loam. The substratum, at a depth of more than 65 inches, is yellowish brown loam. The surface layer is loam in places. In some other places the subsoil is thicker or is less clayey in the lower part. In some areas, the substratum is more clayey or the surface layer and upper part of the subsoil are sandy loam. The slope in some areas is more than 12 percent.

Included with this soil in mapping are small areas of the well drained Cincinnati soils on side slopes and narrow ridgetops. Included soils make up about 7 percent of the map unit.

Available water capacity of this Bonnell soil is high. Permeability is slow. The organic matter content of the surface layer is moderately low. Surface water runoff is medium. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops, hay, or pasture. Some areas are used as woodland or wildlife habitat.

This soil is fairly well suited to corn, soybeans, tobacco, and small grain. There is a severe hazard of erosion. A crop rotation that includes grasses and legumes, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves protective amounts of crop residue on the surface help to control erosion and surface runoff. Cover crops help to control surface runoff and erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, poor tilth, and thin stands. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition and the equipment limitation are the major concerns. Seedlings survive and grow well if competing vegetation and erosion are controlled. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. When roads are wet, they are sticky and slippery and ruts form quickly. Placing roads on the contour helps to control erosion. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings because of the shrink-swell potential. Strengthening foundations, footings, and basement walls and backfilling with coarser material help prevent the structural damage caused by shrinking and swelling. This soil has severe limitations as a site for local roads and streets because of low strength and shrinking and swelling. Strengthening or replacing the base material helps to improve the suitability for supporting vehicular traffic. This soil has severe limitations as a site for septic tank absorption fields because of the slow permeability. Filling or mounding the absorption field with suitable material and elevating the field will help minimize the permeability problem.

The land capability classification is IIIe. The woodland ordination symbol is 4C.

BoD2—Bonnell silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on hillsides on uplands. Areas are long and narrow and are 3 to 80 acres in size. The dominant size is about 12 acres. Slopes are 50 to 250 feet in length.

Typically, the surface layer is dark brown silt loam about 2 inches thick. The subsurface layer is pale brown silt loam about 3 inches thick. The subsoil is about 50 inches thick. It is yellowish brown, firm loam in the upper part; yellowish brown, firm clay loam in the next part; and brown, firm clay loam in the lower part. The substratum to a depth of 60 inches or more is dark yellowish brown clay loam. Some areas have slopes of more than 18 percent or less than 12 percent. In some areas the subsoil or the substratum is less clayey.

Included with this soil in mapping are areas of the well drained Cincinnati soils on the upper side slopes and

narrow ridgetops. Also included are narrow areas of colluvial soils in drainageways and well drained Eden soils on hillsides. In some areas the lower part of the subsoil is redder and is underlain by hard limestone bedrock. Included soils make up about 10 percent of the map unit.

Available water capacity in this Bonnell soil is high. Permeability is slow. The organic matter content in the surface layer is moderately low. Surface runoff is rapid. The surface layer is dominantly strongly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is high.

Most areas of this soil are woodland. Some areas are used for pasture or hay. A few areas are used for cultivated crops.

This soil is poorly suited to cultivated crops because of a very severe hazard of erosion. A conservation tillage system that leaves all or part of the crop residue on the surface, diversions, and cover crops help to control erosion.

This soil is fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture. A cover of grasses and legumes helps to control erosion. The main concern is overgrazing. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition (fig. 4).

This soil is fairly well suited to trees. Plant competition and the equipment limitation are the major concerns. Seedlings survive and grow well if competing vegetation and erosion are controlled. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. When the soil is wet, roads are sticky and slippery and ruts form quickly. Performing timbering operations on the contour helps to control erosion. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil has severe limitations as a site for dwellings because of the slope and the shrink-swell potential. Special design helps to overcome the slope. Diversions, terraces, and grassed waterways between lots will help to control erosion. Stockpiled topsoil can be replaced and seeded to grasses after construction is complete. Sediment settling basins help to control downstream silting. Backfilling with coarser material helps prevent the structural damage caused by shrinking and swelling. This soil has severe limitations as a site for local roads and streets because of slope, shrinking and swelling, and low strength. Constructing local roads on the contour and land shaping help to overcome the slope. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. The soil has severe limitations as a site for septic tank absorption fields because of the slope and the slow permeability. Filling or mounding the absorption field with suitable fill material and elevating the field will help to minimize the permeability problem.

The land capability classification is IVe. The woodland ordination symbol is 4R.

BoE2—Bonnell silt loam, 18 to 25 percent slopes, eroded. This moderately steep, deep, well drained soil is on hillsides on uplands. Areas are long and narrow and are 3 to 40 acres in size. The dominant size is about 8 acres. Slopes range from 50 to 250 feet in length.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 44 inches thick and is yellowish brown and firm. It is clay, clay loam, and loam. The substratum to a depth of 60 inches or more is yellowish brown loam. Some areas have slopes of more than 25 percent or less than 18 percent. In places, the subsoil is less clayey or the substratum is more clayey. Some areas are underlain by soft, calcareous shale and limestone bedrock.

Included with this soil in mapping are narrow areas of colluvial soils in drainageways. Also included are areas of well drained, moderately deep Eden and Edenton soils on hillsides. Included soils make up about 6 percent of the map unit.

Available water capacity in this Bonnell soil is moderate. Permeability is slow. The organic matter content in the surface layer is moderately low. Surface runoff is rapid. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is high.

Most areas are used for woodland. A few areas are used for small grain, pasture, or hay. This soil is generally unsuited to cultivated crops because of the slope and a severe hazard of erosion.

This soil is poorly suited to grasses and legumes for hay and pasture. The slopes limit the use of most types of farm equipment. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. The use of equipment is limited. When the soil is wet, roads are slippery and ruts form quickly. Placing roads, skid trails, and landings on gentle grades and using water bars, culverts, and drop structures help to control erosion. Seedlings survive and grow well if competing vegetation and erosion are controlled. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings because of shrinking and swelling and slope. It is severely limited as a site for local roads because of low

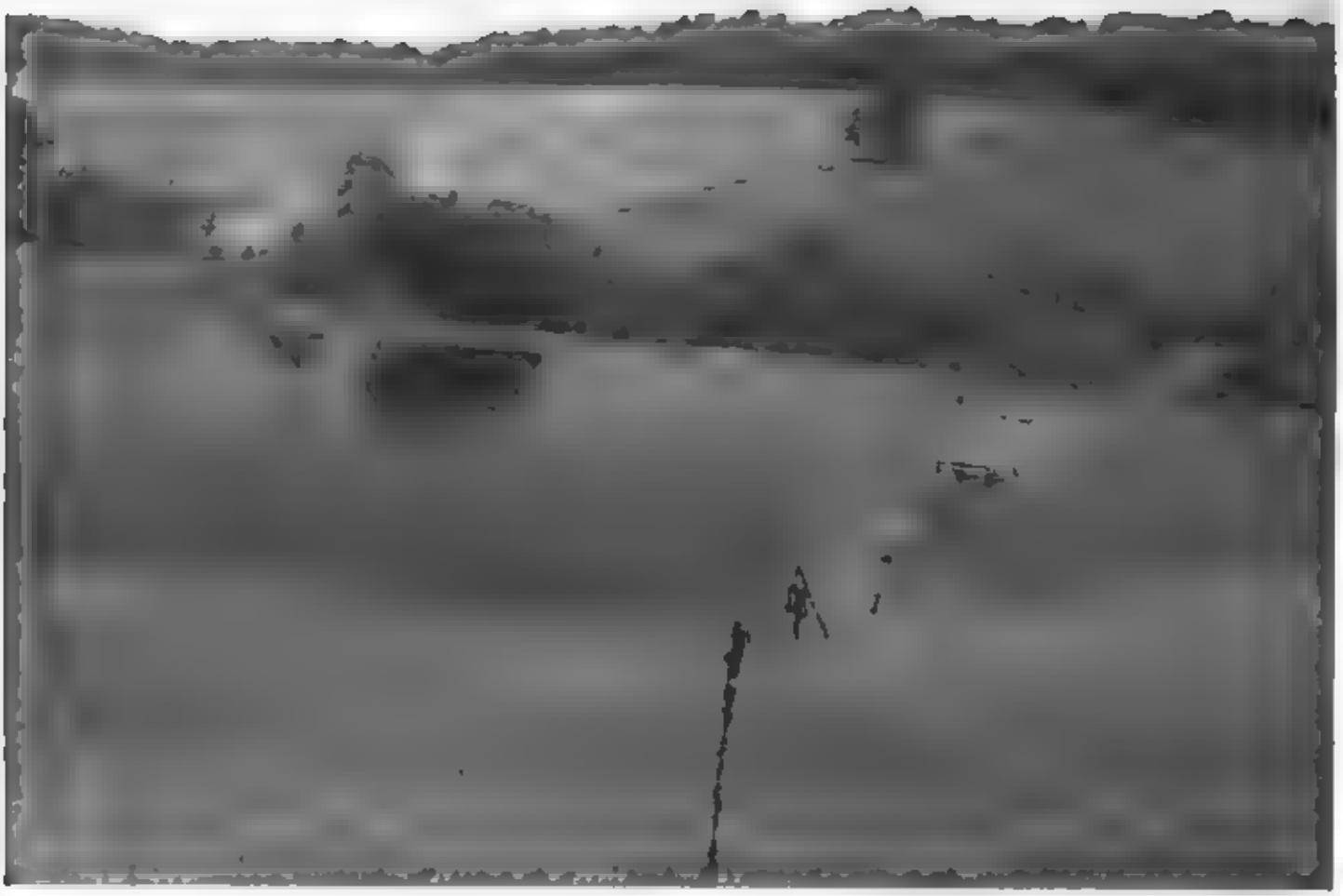

Figure 4.—This pond in an area of Bonnell silt loam, 12 to 18 percent slopes, eroded, provides water for livestock on a well maintained pasture.

strength, shrinking and swelling, and slope. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. This soil is generally unsuitable as a site for septic tank absorption fields because of the slow permeability and the slope.

The land capability classification is VIe. The woodland ordination symbol is 4R.

BpD3—Bonnell clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on hillsides on uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Areas are mainly long and narrow and are 3 to 30 acres in size. The dominant size is about 25 acres. Slopes are 50 to 250 feet in length.

Typically, the surface layer is brown clay loam about 3 inches thick. The subsoil is yellowish brown, brown, and dark yellowish brown, firm clay loam about 44 inches thick. The substratum to a depth of 60 inches or more is yellowish brown loam. Some areas have slopes of more than 18 percent or less than 12 percent. In places the soil is less eroded and is less clayey in the surface layer. In some areas the subsoil is more clayey, the lower part of the subsoil is brown and strong brown and is underlain by hard limestone bedrock, or the lower part formed in clayey material weathered from soft,

calcareous shale and limestone bedrock. In some areas the substratum is silty clay

Included with this soil in mapping are narrow areas of colluvial soils in drainageways. Also included are small areas of well drained, silty Cincinnati soils on the upper hillsides and narrow ridgetops. Included soils make up about 10 percent of the map unit.

Available water capacity in this Bonnell soil is moderate. Permeability is slow. The organic matter content of the surface layer is low. Runoff is rapid from cultivated areas. The surface layer dominantly is medium acid. It is cloddy. The shrink-swell potential is moderate

Most areas are used for hay and pasture. Some areas are used for cultivated crops, woodland, or wildlife habitat. This soil is generally unsuited to cultivated crops because of the slope and a severe hazard of further erosion.

This soil is poorly suited to grasses and legumes for hay and is fairly well suited to pasture. The main concern is overgrazing, which causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. The hazard of erosion, seedling mortality, plant competition, and the equipment limitation are management concerns. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Seedling mortality can be reduced by the use of containerized stock. When the soil is wet, roads are slippery and ruts form quickly. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil has severe limitations as a site for dwellings because of the slope and the shrink-swell potential. Special design helps to overcome the slope. Diversions, terraces, and grassed waterways between lots will help to control erosion. Stockpiled topsoil can be replaced and seeded to grasses after construction is complete. Sediment settling basins help to control downstream silting. Backfilling with coarser material helps prevent the structural damage caused by shrinking and swelling. This soil has severe limitations as a site for local roads and streets because of slope, shrinking and swelling, and low strength. Constructing the roads on the contour and land shaping help to overcome the slope. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. The soil has severe limitations as a site for septic tank absorption fields because of the slope and the slow permeability. Filling or mounding the absorption field with suitable fill material and elevating the field will help to minimize the permeability problem.

The land capability classification is VIe. The woodland ordination symbol is 3R.

BrC3—Bonnell silty clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on ridgetops and hillsides on uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Areas are long and narrow and are 3 to 20 acres in size. The dominant size is about 10 acres. Slopes are 50 to 200 feet in length.

Typically, the surface layer is brown silty clay loam about 6 inches thick. The subsoil is about 69 inches thick. It is yellowish brown, firm silty clay loam, clay, and clay loam. The substratum to a depth of 80 inches or more is dark yellowish brown, mottled clay loam. In places the subsoil is silty clay or is brown and strong brown and is underlain by hard limestone bedrock. In some areas the substratum is silty clay or is clayey material weathered from the soft shale and limestone bedrock at a depth of 60 inches or more.

Included with this soil in mapping are areas of well drained Carmel soils on ridgetops and hillsides and well drained Cincinnati soils in the higher landscape positions. Cincinnati soils are less clayey than the Bonnell soil. Included soils make up about 10 percent of the map unit.

Available water capacity in this Bonnell soil is moderate. Permeability is slow. The organic matter content of the surface layer is low. Runoff from cultivated areas is rapid. The surface layer is dominantly slightly acid. It is cloddy. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few areas are used for woodland or wildlife habitat.

This soil is poorly suited to corn, soybeans, small grain, and tobacco because of a severe hazard of further erosion. A conservation tillage system that leaves all or part of the crop residue on the surface, a crop rotation that includes grasses and legumes and cover crops, contour farming, and diversions help to control erosion and maintain tilth. Tilling at the proper moisture content minimizes surface compaction and improves tilth.

This soil is fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes helps to control erosion. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Plant competition, seedling mortality, and the equipment limitation are the main concerns. Seedlings survive and grow well if competing vegetation is controlled by special harvest methods, by site preparation, or by spraying, cutting, or girdling unwanted trees or shrubs. When the soil is wet, roads are sticky and slippery and ruts form quickly

Performing timbering operations on the contour helps to control erosion. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings because of the shrink-swell potential. Strengthening foundations, footings, and basement walls and backfilling with coarser material help prevent the structural damage caused by shrinking and swelling. This soil has severe limitations as a site for local roads and streets because of low strength and shrinking and swelling. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. This soil has severe limitations as a site for septic tank absorption fields because of the slow permeability. Filling or mounding the absorption field with suitable material and elevating the field will help minimize the permeability problem.

The land capability classification is IVe. The woodland ordination symbol is 3C.

CbC2—Carmel silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on the upper hillsides and narrow ridgetops on uplands. Areas are long and narrow and are 10 to 100 acres in size. The dominant size is about 30 acres. Slopes range from 50 to 150 feet in length.

Typically, the surface layer is dark yellowish brown silt loam about 6 inches thick. The subsoil is about 36 inches thick. It is yellowish brown, firm silty clay loam in the upper part and yellowish brown, very firm silty clay in the lower part. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 42 inches. In places, the surface layer is more than 18 inches thick and the subsoil is silt loam. In some other places, a thin layer of glacial till is in the subsoil or the bedrock is at a depth of less than 40 inches. In some areas slopes are more than 12 percent.

Included with this soil in mapping are areas of well drained Bonnell, Cincinnati, and Weisburg soils on the upper side slopes and narrow ridgetops. These soils are less clayey than the Carmel soil. All but the Bonnell soils have a fragipan. Included soils make up about 10 percent of the map unit.

Available water capacity in this Carmel soil is moderate. Permeability is very slow. The organic matter content of the surface layer is moderately low. Surface runoff is medium. The surface layer is dominantly medium acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops or for hay and pasture. Some areas are used as woodland or wildlife habitat.

This soil is fairly well suited to corn, soybeans, tobacco, and small grain. There is a severe hazard of erosion. A crop rotation that includes grasses and legumes, contour farming, grassed waterways, grade stabilization structures, and a conservation tillage system that leaves protective amounts of crop residue on the surface help to control erosion and surface runoff. Cover crops help to control surface runoff and erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, poor tilth, and thin stands. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Seedling mortality and the hazard of windthrow are the main concerns. Special planting stock and overstocking are needed because of seedling mortality. Harvesting methods that do not leave trees standing alone or widely spaced will reduce windthrow. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings because of the shrink-swell potential. Strengthening foundations, footings, and basement walls and backfilling with coarser material help to prevent the structural damage caused by shrinking and swelling. This soil is severely limited as a site for local roads and streets because of low strength and shrinking and swelling. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the very slow permeability. Installing a large absorption field on the contour, filling or mounding the absorption field with suitable material, and elevating the field will help to minimize the permeability problem.

The land capability classification is IIIe. The woodland ordination symbol is 5C.

CkB2—Cincinnati silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on side slopes and narrow ridgetops on uplands. Areas are irregular in shape and are 3 to 50 acres in size. Slopes are 50 to 200 feet in length.

Typically, the surface layer is brown silt loam about 7 inches thick. It has specks of yellowish brown material from the subsoil. The subsoil extends to a depth of 80 inches or more. It is yellowish brown, firm silty clay loam in the upper part; a fragipan of brown and yellowish brown, very firm, brittle silt loam and loam in the next part; and yellowish brown, firm clay loam in the lower part. In places the lower part of the subsoil is more clayey and is underlain by calcareous shale and limestone.

Included with this soil in mapping are small areas of the moderately well drained Rossmoyne soils on the upper side slopes and a few areas of colluvial soils in

drainageways. Included soils make up about 12 percent of the map unit.

Available water capacity in this Cincinnati soil is moderate. Permeability is moderate above the fragipan and slow in and below the fragipan. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. This soil has a water table perched at a depth of 2.5 to 4.0 feet during late winter and early spring. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, small grain, and tobacco if erosion is controlled. A crop rotation that includes grasses and legumes and a conservation tillage system that leaves protective amounts of crop residue on the surface help prevent excessive erosion and conserve moisture. The soil is well suited to no-till farming. Because of the slow permeability in the fragipan, the soil is droughty and the moisture content in the soil sometimes is inadequate for late-maturing crops.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. The fragipan limits the suitability for deep-rooted legumes such as alfalfa. Most stands of legumes last 2 to 3 years. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings with basements because of wetness. A subsurface drainage system near footings will help remove water. The soil is severely limited as a site for local roads and streets because of low strength and potential frost action. Raised, well compacted fill material and adequate side ditches and culverts will help remove excess water and protect the roads from frost action. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the slow permeability and the wetness. Enlarging the absorption field helps to minimize the permeability problem. Installing interceptor drains around the perimeter of the absorption field helps to lower the water table.

The land capability classification is IIe. The woodland ordination symbol is 4A.

CkC2—Cincinnati silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on narrow ridgetops and side slopes on uplands. Areas are irregular in shape or long and narrow and are 3 to 25 acres in size. Slopes are 50 to 150 feet in length.

Typically, the surface layer is brown silt loam about 6 inches thick. It has specks of yellowish brown material from the subsoil. The subsoil extends to a depth of 80 inches. It is yellowish brown, firm silt loam in the upper part; a fragipan of very firm, brittle silt loam and loam in the next part; and mottled, firm clay loam in the lower part. In a few areas slopes are less than 6 percent or more than 12 percent. In places the lower part of the subsoil is more clayey and is underlain by calcareous shale and limestone.

Included with this soil in mapping are small areas of colluvial soils in drainageways less than 20 feet wide and small areas of well drained Bonnell soils on narrow ridgetops. Included soils make up about 6 percent of the map unit.

Available water capacity in this Cincinnati soil is moderate. Permeability is moderate above the fragipan and slow in and below the fragipan. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. This soil has a water table perched at a depth of 2.5 to 4.0 feet during late winter and early spring. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas of this soil are used as woodland. A few areas are used for cultivated crops, and a few are used for hay and pasture.

This soil is fairly well suited to corn, soybeans, tobacco, and small grain. A conservation tillage system that leaves all or part of the crop residue on or in the surface layer, a crop rotation that includes grasses and legumes, terraces, cover crops, and contour farming help to prevent excessive erosion. The soil is well suited to no-till farming. It is droughty because of the fragipan, and the moisture content in the soil sometimes is inadequate for late-maturing crops. Cover crops help to maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. The fragipan limits the suitability for deep-rooted legumes such as alfalfa. Most stands of legumes last 2 to 3 years. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the wood and.

This soil is moderately limited as a site for dwellings because of slope. Wetness also is a moderate limitation on sites for dwellings with basements. Planting grasses as soon as possible at building sites helps to protect the soil. Sediment basins help to control silting downstream. A surface drainage system near footings helps to remove water. This soil has severe limitations as a site for local roads and streets because of low strength and potential frost action. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and adequate side ditches and culverts will help protect the roads from frost damage. This soil has severe limitations as a site for septic tank absorption fields because of the slow permeability and the wetness. Interceptor drains installed around the perimeter of the absorption field will help lower the water table. Filling or mounding the absorption field with suitable material, elevating the field, or enlarging the field will help to minimize the permeability problem.

The land capability classification is IIIe. The woodland ordination symbol is 4A.

CkC3—Cincinnati silt loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on side slopes and narrow ridgetops on uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Areas are irregular in shape or long and narrow and are 3 to 50 acres in size. The dominant size is about 12 acres. Slopes are 50 to 200 feet in length.

Typically, the surface layer is yellowish brown silt loam about 7 inches thick. The subsoil is about 63 inches thick. It is yellowish brown, very firm and brittle silt loam in the upper part; a fragipan of yellowish brown and dark yellowish brown, very firm and brittle silt loam and loam in the next part; and yellowish brown, firm clay loam in the lower part. The substratum to a depth of 80 inches or more is dark yellowish brown loam. In places the lower part of the subsoil is more clayey and is underlain by calcareous, soft shale and limestone. In some areas slopes are more than 12 percent or less than 6 percent.

Included with this soil in mapping are small areas of the well drained Bonnell soils on narrow side slopes and a few areas of colluvial soils in drainageways. Included soils make up about 4 percent of the map unit.

Available water capacity in this Cincinnati soil is low. Permeability is moderate above the fragipan and slow in and below the fragipan. The organic matter content of the surface layer is low. Surface runoff is rapid. A water table is perched at a depth of 2.5 to 4.0 feet during late winter and early spring. The surface layer is dominantly slightly acid. It is firm and cloddy. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture or for wildlife habitat that is reverting to hardwoods.

This soil is poorly suited to cultivated crops because of the slope and a severe hazard of further erosion. It is droughty because of the fragipan, and the moisture content of the soil sometimes is inadequate for late-maturing crops. A conservation tillage system that leaves all or part of the crop residue on the surface, a crop rotation that includes grasses and legumes and cover crops, terraces, grassed waterways (fig. 5), and grade stabilization structures help to prevent excessive erosion and surface runoff. The soil is well suited to no-till farming.

This soil is fairly well suited to grasses and legumes such as orchardgrass and red clover for hay and pasture. The fragipan limits the suitability for deep-rooted legumes. Most legume stands last 1 to 3 years. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of slope. Wetness also is a moderate limitation on sites for dwellings with basements. Planting grasses as soon as possible at building sites helps to protect the soil. Sediment basins help to control silting downstream. A surface drainage system near footings helps to remove water. This soil has severe limitations as a site for local roads and streets because of low strength and potential frost action. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and adequate side ditches and culverts will help protect the roads from frost damage. This soil has severe limitations as a site for septic tank absorption fields because of the slow permeability and the wetness. Interceptor drains installed around the perimeter of the absorption field will help lower the water table. Filling or mounding the absorption field with suitable material, elevating the field, or enlarging the field will help to minimize the permeability problem.

The land capability classification is IVe. The woodland ordination symbol is 4A.

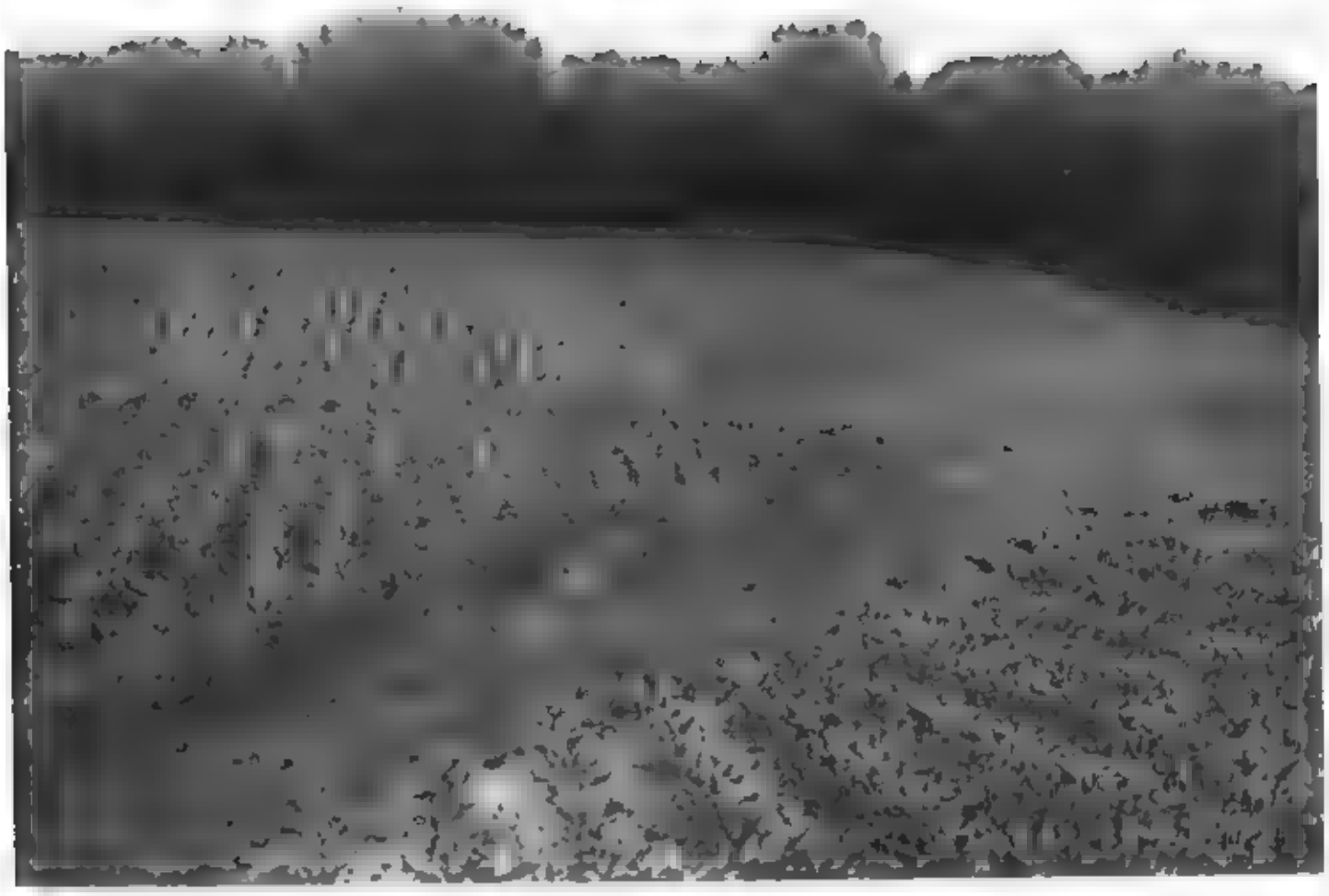

Figure 5.—A grassed waterway in an area of Cincinnati silt loam, 6 to 12 percent slopes, severely eroded.

Cm—Cobbsfork silt loam. This nearly level, deep, poorly drained soil is on broad flats on uplands. It is frequently ponded. Areas are irregular in shape and are 5 to 2,000 acres in size. The dominant size is about 400 acres. Slopes are 0 to 1 percent.

Typically, the surface layer is gray, mottled silt loam about 13 inches thick. The subsurface layer is gray, mottled silt loam about 8 inches thick. The subsoil extends to a depth of 80 inches. It is light brownish gray, mottled, firm silt loam and silty clay loam in the upper part and yellowish brown, mottled, firm silty clay loam in the lower part. In some areas the soil is dominantly very firm, brittle silt loam below a depth of 40 inches.

Included with this soil in mapping are areas of the somewhat poorly drained Avonburg soils. These soils are closer to drainageways than the Cobbsfork soil. They make up about 3 percent of the map unit.

Available water capacity of this Cobbsfork soil is high. This soil is very slowly permeable. The organic matter content of the surface layer is moderately low. Surface runoff is very slow. A water table is at or near the surface during winter and spring, and the soil often is ponded after periods of significant rainfall. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for row crops. Some areas are used for small grain. A few areas are used for hay, pasture, or woodland.

If adequately drained, this soil is fairly well suited to corn, soybeans, and small grain. It is poorly suited to tobacco. Wetness is the major limitation. Water on the surface causes a hazard of sun scald to tobacco. A conservation cropping system that is dominated by row crops can be used, but surface drainage should be improved, mainly by land leveling and shaping. A subsurface drainage system generally works for only a few years because silt plugs the drains. Outlets are not readily available. Frost heaving damages small grain crops during some years. Cover crops and a system of conservation tillage that leaves all or part of the crop residue on the surface help maintain the organic matter content and good tilth.

This soil is well suited to grasses and legumes such as reed canarygrass and ladino clover for hay and pasture. Deep-rooted legumes are poorly suited, however, because of the prolonged high water table. The main concern is overgrazing, which causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods will help to keep the pasture and the soil in good condition.

This soil is well suited to trees. The equipment limitation, seedling mortality, windthrow, and plant competition are management concerns. Harvesting and logging should be delayed until the soil is dry or frozen. Planting seedlings on bedding ridges will increase the survival rate. Leaving trees closely spaced after harvest will help control windthrow. Competing vegetation can be controlled by cutting, spraying, or girdling unwanted trees or shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings and sanitary facilities because of ponding. It is severely limited as a site for local roads because of ponding and potential frost action. Raised, well compacted fill material and adequate side ditches and culverts will help protect the roads from ponding and frost damage. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic.

The land capability classification is IIIw. The woodland ordination symbol is 6W.

CoG—Corydon silty clay loam, 18 to 50 percent slopes. This moderately steep to very steep, shallow, well drained soil is on the upper hillsides and escarpments on uplands in the northwest part of the county. Areas are long and narrow and are 5 to 60 acres in size. The dominant size is about 30 acres. Slopes are 50 to 400 feet in length.

Typically, the surface layer is very dark grayish brown silty clay loam about 3 inches thick. The subsoil is about 14 inches thick. It is dark brown and brown, firm silty clay loam in the upper part and brown, friable flaggy loam in the lower part. Hard limestone bedrock is at a depth of about 17 inches. In some areas the bedrock is at a depth of less than 10 inches or more than 20 inches. In places, the surface layer is flaggy or the subsoil is silt loam.

Included with this soil in mapping are many rock outcrops and escarpments. Also included are quarries where the bedrock is at the surface and narrow areas of well drained colluvial soils in drainageways. Included areas make up about 10 percent of the map unit.

Available water capacity in this Corydon soil is very low. Permeability is moderately slow. The organic matter content of the surface layer is moderate. Surface runoff is very rapid. The surface layer is dominantly mildly alkaline. It is friable. The shrink-swell potential is moderate.

This soil is used for woodland and stone quarries. It is generally unsuited to cultivated crops because of the slope and the depth to hard bedrock. It is generally unsuited to grasses and legumes for hay or pasture because of the slope and the very low available water capacity.

This soil is poorly suited to trees. Erosion, the equipment limitation, seedling mortality, and the windthrow hazard are management concerns. Locating roads, skid trails, and landings on gentle grades and using water bars, culverts, and drop structures help to control erosion. Special operations, such as yarding logs uphill with cable, are needed to minimize the use of rubber-tire and crawler tractors. Special containerized planting stock or overstocking may be needed because of seedling mortality. Use of harvest methods that leave trees closely spaced helps to overcome the windthrow hazard.

This soil is generally unsuitable as a site for dwellings and sanitary facilities because of the depth to bedrock and the slope. It is severely limited as a site for local roads because of the depth to bedrock, the slope, and low strength.

The land capability classification is VIIs. The woodland ordination symbol is 4R.

Cy—Cyclone silt loam. This nearly level, deep, poorly drained soil is in broad depressions on uplands. It is subject to ponding. Areas are irregular in shape and are 3 to 120 acres in size. The dominant size is about 25 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is very dark grayish brown silt loam about 10 inches thick. The subsurface layer is very dark gray, mottled silt loam about 7 inches thick. The subsoil is about 40 inches thick. It is gray, mottled, firm silty clay loam in the upper part; yellowish brown, mottled, firm silt loam in the next part; and yellowish brown, mottled, firm loam in the lower part. The substratum to a depth of 65 inches or more is yellowish brown, mottled loam. In places, the substratum is more permeable or the soil is more clayey and is stratified.

Included with this soil in mapping are small areas of somewhat poorly drained Fincastle and Reesville soils on slight swells. Included soils make up about 8 percent of the map unit.

Available water capacity in this Cyclone soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content in the surface layer is moderate. Surface runoff is very slow or ponded. This soil has a water table near or above the surface during winter and spring. The surface layer is dominantly neutral. It is firm and is cloddy if tilled when wet. The shrink-swell potential is moderate.

Most areas of this soil have been drained and are used for cultivated crops. Some areas are used for small grain. A few areas are used for hay, pasture, or woodland.

If adequately drained, this soil is well suited to corn, soybeans, and small grain. It is poorly suited to tobacco because ponding causes a hazard of sun scald to tobacco. Excess water can be removed by subsurface drains, surface drains, or open ditches or by a combination of those practices. A conservation tillage system that leaves all or part of the crop residue on the surface helps maintain tilth and the organic matter content. The soil is well suited to fall plowing.

This soil is well suited to grasses and legumes such as reed canarygrass and ladino clover for hay and pasture. Many deep-rooted legumes such as alfalfa are poorly suited, however, because of the seasonal high water table, ponding, and frost heaving. A drainage system is necessary. Overgrazing or grazing when the soil is wet causes surface compaction and poor tilth and reduces plant density and hardiness. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods will minimize surface compaction and maintain good tilth and plant density.

This soil is fairly well suited to trees. The equipment limitation, plant competition, seedling mortality, and the windthrow hazard are management concerns. Harvesting or logging should be delayed until the soil is dry or frozen. Leaving trees closely spaced helps to prevent windthrow. Seedlings survive and grow well if competing vegetation is controlled by such methods as cutting, spraying, or girdling undesired trees. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings and sanitary facilities because of ponding. It is severely limited as a site for local roads because of potential frost action, ponding, and low strength. Raised, well compacted fill material and adequate side ditches and culverts will help to protect the roads from ponding and frost damage. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic.

The land capability classification is IIw. The woodland ordination symbol is 5W.

Db—Dearborn loam, frequently flooded. This nearly level, deep, well drained soil is on narrow flood plains. It is frequently flooded for brief periods from November to March. Areas are long and narrow and are 3 to 30 acres in size. The dominant size is about 20 acres.

Typically, the surface layer is dark brown loam about 10 inches thick. The subsoil is dark brown, friable channery loam about 5 inches thick. The part of the substratum from a depth of 15 to 48 inches is brown extremely channery loam. The part from a depth of 48 to 60 inches is brown extremely flaggy loam. In places, the surface layer is channery loam or the depth to bedrock is 40 to 60 inches. In some other places the subsoil and substratum contain less than 35 percent rock fragments. In a few areas the soil is underlain by bluish gray glacial or lacustrine material at a depth of 3 to 6 feet.

Included with this soil in mapping are narrow areas of well drained Wooiper soils on the higher parts of the landscape. These soils make up about 5 percent of the map unit.

Available water capacity in this Dearborn soil is low. Permeability is moderate. The organic matter content of the surface layer is moderate. Surface runoff is slow. The surface layer dominantly is moderately alkaline. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. Some areas are used for pasture, hay, woodland, or wildlife habitat.

This soil is fairly well suited to cultivated crops. It is well suited to tobacco. Spring and winter flooding is the major hazard, and the low available water capacity is the major limitation. Conservation tillage that leaves all or part of the crop residue on the surface helps to conserve moisture and reduce scouring.

This soil is well suited to grasses and legumes for hay and pasture. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees or shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities and is severely limited as a site for local roads. Raised, well compacted fill material and adequate side ditches and culverts will help protect roads from flooding.

The land capability classification is IIIs. The woodland ordination symbol is 6A.

EbE2—Eden flaggy silty clay, 15 to 25 percent slopes, eroded. This strongly sloping and moderately steep, moderately deep, well drained soil is on hillsides on uplands. Areas are irregular in shape and are 5 to 100 acres in size. The dominant size is about 30 acres. Slopes are 100 to 600 feet in length.

Typically, the surface layer is dark brown flaggy silty clay about 5 inches thick. The subsoil is olive and light olive brown, very firm flaggy silty clay about 20 inches thick. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 25 inches. In some areas the surface layer is not flaggy or is up to 18 inches of loess. In places the depth to bedrock is less than 20 inches or more than 40 inches. A few areas have a thin layer of glacial till in the upper part of the subsoil. Some areas have slopes of less than 15 percent or more than 25 percent.

Included with this soil in mapping are areas of well drained Carmel soils on the upper side slopes. These soils are less flaggy than the Eden soil. Also included are small areas of the dark, well drained Dearborn soils along drainageways. Included soils make up about 10 percent of the map unit.

Available water capacity in this Eden soil is low. Permeability is slow. The organic matter content of the surface layer is moderately low. Surface runoff is rapid. The surface layer is dominantly neutral. Root development and water movement in this soil are limited by the bedrock. The shrink-swell potential is moderate.

Most areas are used for pasture, woodland, or wildlife habitat. This soil is generally unsuited to cultivated crops because of the slope and a severe hazard of erosion.

This soil is fairly well suited to grasses and legumes for pasture. A cover of grasses and legumes helps to control erosion and surface runoff. The soil is poorly suited to grasses and legumes for hay because of the slope. Frost heave is a hazard affecting deep-rooted legumes. Overgrazing causes surface compaction, excessive surface runoff, poor tilth, and thin stands. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep pasture and the soil in good condition.

This soil is fairly well suited to trees. The equipment limitation, seedling mortality, and the windthrow hazard are the main concerns. When the soil is wet, roads are slippery and ruts form quickly. Special operations, such as yarding logs uphill with a cable, are needed to minimize the use of rubber-tire and crawler tractors. Special containerized planting stock or overstocking may be needed because of seedling mortality. Harvest methods that leave trees closely spaced help to prevent windthrow. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings and sanitary facilities because of the slope and the depth to bedrock. It is severely limited as a site for local roads because of the slope and low strength. Constructing the roads on the contour and land shaping help to overcome the slope. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. Because of shrinking and swelling, slippage is a severe hazard when the soil is wet.

The land capability classification is VIe. The woodland ordination symbol is 4R.

EdG—Eden very flaggy silty clay, 25 to 60 percent slopes, stony. This steep and very steep, moderately deep, well drained soil is on hillsides on uplands. Areas are long and narrow and are 5 to 1,000 acres in size. The dominant size is about 100 acres. Slopes are 200 to 1,300 feet in length.

Typically, the surface layer is very dark grayish brown very flaggy silty clay about 2 inches thick. The subsoil is about 21 inches thick. It is brown, firm very flaggy silty clay and clay in the upper part and light olive brown, firm flaggy silty clay in the lower part. Interbedded, soft, calcareous shale and thin-bedded limestone are at a depth of about 23 inches. In some areas the depth to bedrock is less than 20 inches or more than 40 inches. Some slopes are less than 25 percent.

Included with this soil in mapping are areas of well drained Dearborn soils along drainageways. Also included are a few areas of well drained Uniontown soils on the lower hillsides. Included soils make up about 7 percent of the map unit.

Available water capacity in this Eden soil is low. Permeability is slow. The organic matter content of the surface layer is moderate. Surface runoff is rapid. The surface layer is dominantly neutral. Root development and water movement in this soil are limited by the bedrock. The shrink-swell potential is moderate.

Most areas of this soil are used for woodland. A few areas are used for pasture. Because of the slope, the stones on and below the surface, and a high content of clay, this soil is generally unsuited to cultivated crops and to grasses and legumes for hay and is poorly suited to pasture. Close-growing crops help to prevent excessive surface runoff and erosion. The shrink-swell potential and frost heave are hazards affecting deep-rooted legumes. Use of equipment for pasture renovation or management is severely limited because of the slope and the stones. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. The equipment limitation, the erosion hazard, seedling mortality, and the windthrow hazard are management concerns. The slopes are generally too steep for the use of most types of equipment. Locating roads, skid trails, and landings on gentle grades and removing water with water bars,

culverts, and drop structures help to control erosion. Special containerized planting stock or overstocking may be needed because of seedling mortality. Harvest methods that leave trees closely spaced help to prevent windthrow. Competing vegetation can be controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings and sanitary facilities because of the slope and the depth to bedrock. It is severely limited as a site for local roads because of the slope and low strength. Constructing the roads on the contour and land shaping help to overcome the slope. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. Because of shrinking and swelling, slippage is a severe hazard when the soil is wet.

The land capability classification is VIIs. The woodland ordination symbol is 4R.

EeD2—Edenton silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, moderately deep, well drained soil is on side slopes on uplands. Areas mainly are long and narrow and are 4 to 40 acres in size. The dominant size is about 15 acres. Slopes range from 50 to 300 feet in length.

Typically, the surface layer is dark yellowish brown silt loam about 5 inches thick. The subsoil is about 29 inches thick. It is yellowish brown and dark yellowish brown, firm clay loam in the upper part and light olive brown, very firm channery clay in the lower part. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 34 inches. In some areas the depth to bedrock is more than 40 inches. In places the upper part of the subsoil is less clayey, the subsoil formed entirely in material weathered from calcareous, soft shale and limestone, or there is no surface layer. In some other places slopes are more than 18 percent or less than 12 percent. In places the soil formed entirely in glacial till. In many areas the lower part of the subsoil is channery.

Included with this soil in mapping are small, narrow areas of colluvial soils in drainageways. Included soils make up about 11 percent of the map unit.

Available water capacity in this Edenton soil is low. Permeability is slow. The organic matter content is moderately low in the surface layer. Surface runoff is rapid. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the bedrock at a depth of 20 to 40 inches.

Most areas of this soil are used for pasture. A few areas are used for cultivated crops. Some areas are used for hay, woodland, or wildlife habitat.

This soil is poorly suited to corn, soybeans, and small grain because of the slope, the low available water capacity, and a severe hazard of erosion. A conservation tillage system that leaves protective amounts of crop residue on the surface and a crop rotation that includes grasses and legumes and cover crops help to prevent excessive erosion and conserve moisture.

This soil is fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes helps to control erosion. The bedrock limits the growth of many deep-rooted legumes. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, pasture renovation, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Plant competition, the erosion hazard, and the equipment limitation are major concerns. Locating roads, skid trails, and landings on gentle grades and removing water with water bars, culverts, and drop structures help to control erosion. When the soil is wet, roads are slippery and ruts form quickly. Special logging equipment is needed because of the slope. Competing vegetation can be controlled by selective cutting rather than clearcutting, by site preparation, or by spraying, cutting, or girdling unwanted trees or shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings because of the slope. It is severely limited as a site for local roads and streets because of low strength and the slope. The buildings should be designed so that they conform to the natural slope of the land, and the roads and streets should be built on the contour. Strengthening or replacing the base material for the roads and streets improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the slow permeability, the depth to bedrock, and the slope. Filling or mounding the absorption field with suitable material and elevating the field will minimize the permeability problem and increase the depth to bedrock. Installing the distribution lines on the contour will help to overcome the slope.

The land capability classification is IVe. The woodland ordination symbol is 4R.

ElA—Eldean loam, 0 to 2 percent slopes. This nearly level, well drained soil is on river terraces. It is moderately deep over sand and gravel. Areas are irregular in shape and are 4 to 40 acres in size. The dominant size is about 25 acres. Slopes are 50 to 400 feet in length.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is dark brown and is about 22 inches thick. It is firm clay loam in the upper part, firm gravelly clay in the next part, and friable gravelly sandy clay loam in the lower part. The part of the substratum

between depths of 30 and 36 inches is pale brown gravelly coarse sandy loam. The part at a depth of 36 to 60 inches is pale brown very gravelly coarse sand. Some small areas do not have gravel in the subsoil or substratum or have less clay in the subsoil. In places the surface layer and subsoil are more than 40 inches thick or less than 24 inches thick. In some other places the surface layer is very dark grayish brown.

Available water capacity in this Eldean soil is moderate. Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is slow. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the sand and gravel in the substratum. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture.

This soil is well suited to corn, soybeans, tobacco, and small grain, but it is droughty in years when rainfall is low during the growing season. A conservation tillage system that leaves a protective amount of crop residue on the surface and cover crops help improve tilth, the available water capacity, and the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. The major management concerns are overgrazing and droughtiness in years of low rainfall. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees or shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil has slight limitations as a site for dwellings with basements. It is moderately limited as a site for dwellings without basements because of shrinking and swelling. Replacing the more clayey layers with suitable material and strengthening footings help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material with better suited material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because a poor filtering capacity in the substratum can result in the pollution of ground water. Filling or mounding the absorption field with suitable material will help overcome the poor filtering capacity.

The land capability classification is IIs. The woodland ordination symbol is 4A.

EIB—Eldean loam, 2 to 6 percent slopes. This gently sloping, well drained soil is on river terraces. It is moderately deep over sand and gravel. Areas are irregular in shape and are 3 to 12 acres in size. The dominant size is about 10 acres. Slopes are 50 to 150 feet in length.

Typically, the surface layer is brown loam about 8 inches thick. The subsoil is dark brown and firm and is about 22 inches thick. It is loam in the upper part, gravelly clay in the next part, and gravelly clay loam in the lower part. The substratum to a depth of 60 inches or more is gravelly coarse sand that has lenses of coarse sand and fine sand. Some areas have gravelly coarse sandy loam in the upper part of the substratum. Some small areas have no gravel in the subsoil or are less clayey in the subsoil. In places the surface layer is very dark grayish brown. In some other places the thickness of the surface layer and subsoil is more than 40 inches or less than 24 inches.

Available water capacity in this Eldean soil is moderate. Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is medium. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is restricted by the sand and gravel in the substratum. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay and pasture.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard, and the soil is droughty in years when rainfall is low during the growing season. Grasses and legumes in the cropping system and a conservation tillage system that leaves protective amounts of crop residue on the surface help to control erosion. Cover crops also help to control erosion and maintain tilth and the organic matter content. Conservation tillage and cover crops help conserve moisture during periods of low rainfall. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. The major management concerns are overgrazing and droughtiness in years of low rainfall. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and

fostering the growth of seed trees improve the quality of the woodland.

This soil has slight limitations as a site for dwellings with basements. It is moderately limited as a site for dwellings without basements because of shrinking and swelling. Replacing the more clayey layers with suitable material and strengthening footings help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material with better suited material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because a poor filtering capacity in the substratum can result in the pollution of ground water. Filling or mounding the absorption field with suitable material will help overcome the poor filtering capacity.

The land capability classification is IIe. The woodland ordination symbol is 4A.

FcB—Fincastle silt loam, 1 to 3 percent slopes. This very gently sloping, deep, somewhat poorly drained soil is on large flats on uplands. Areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 30 acres. Slopes are 100 to 500 feet in length.

Typically, the surface layer is dark grayish brown silt loam about 9 inches thick. The subsurface layer is grayish brown, mottled silt loam about 4 inches thick. The subsoil is about 38 inches of yellowish brown, mottled, firm silty clay loam, silt loam, and loam. The substratum to a depth of 60 inches or more is yellowish brown, mottled loam. In some areas, the soil has more than 40 inches of loess or the depth to bedrock is less than 60 inches. In some other areas slopes are less than 1 percent.

Included with this soil in mapping are a few areas of moderately well drained Xenia soils along drainageways. Also included are small areas of colluvial soils in drainageways and very poorly drained Cyclone soils in depressions. Included soils make up about 10 percent of the map unit.

Available water capacity in this Fincastle soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet during winter and early spring. The surface layer is dominantly acid unless limed. It is friable and can be tilled throughout a fairly wide range in moisture content. Root growth is limited because the substratum is very firm till. The shrink-swell potential is moderate.

Most areas of this soil are used for corn or soybeans (fig. 6). Some areas are used for small grain. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, and small grain. It is fairly well suited to tobacco. Erosion is the major hazard, and wetness is the major limitation. Surface water causes a hazard of sun scalding on tobacco. If the soil is drained, a conservation cropping system dominated by row crops can be used. A crop rotation that includes grasses and legumes and a conservation tillage system that leaves protective amounts of crop residue on the surface help to control erosion and maintain the organic matter content. A subsurface drainage system will remove excess water.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. It is suited to deep-rooted legumes that are tolerant of a seasonal high water table. Overgrazing and grazing when the soil is wet cause surface compaction and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Harvesting and planting are often delayed because of wetness. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings because of wetness. Using subsurface drains and placing buildings on raised, well compacted fill material can help overcome the wetness. The soil is severely limited as a site for local roads and streets because of low strength and potential frost action. Constructing roads on raised, well compacted fill material and providing adequate side ditches and culverts will help prevent frost damage. Strengthening or replacing the base material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow permeability in the substratum. Interceptor drains around the perimeter of the absorption field can help lower the water table. Filling or mounding the absorption field with suitable material and elevating the field will help minimize the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 4A.

FtA—Fincastle-Reesville silt loams, 0 to 1 percent slopes. These nearly level, deep, somewhat poorly drained soils are on flats on uplands. Areas are broad and irregular in shape and are 10 to 80 acres in size. The dominant size is about 25 acres. Slopes are 100 to 500 feet in length. The unit is 60 percent Fincastle soil and 30 percent Reesville soil. The two soils occur as areas so intermingled that it was not practical to map them separately.

Typically, the surface layer of the Fincastle soil is dark yellowish brown silt loam about 11 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 34 inches of yellowish brown, mottled, firm silty clay loam, silt loam,

Figure 8.—An area of Fincastle silt loam, 1 to 3 percent slopes, double-cropped to soybeans after winter wheat.

and loam. The substratum to a depth of 60 inches or more is brown loam.

Typically, the surface layer of the Reesville soil is dark grayish brown silt loam about 10 inches thick. The subsurface layer is grayish brown, mottled silt loam about 3 inches thick. The subsoil is about 39 inches of yellowish brown, mottled, firm silt loam, silty clay loam, and silt loam. The part of the substratum between depths of 52 and 56 inches is yellowish brown, mottled silt loam and loam. The part at a depth of 56 to more than 60 inches is yellowish brown, mottled loam. In a few places slopes are more than 1 percent.

Included with these soils in mapping are small areas of poorly drained Cyclone soils in depressions. Also

included are a few small areas of moderately well drained Xenia soils on slight swells. Included soils make up about 10 percent of the map unit.

Available water capacity in these Fincastle and Reesville soils is high. Permeability is moderate in the surface layer and subsoil and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is slow. These soils have a water table at a depth of 1 to 3 feet during winter and early spring. The surface layer dominantly is neutral or slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited because the substratum is firm or very firm till.

Most areas of this unit are used for cultivated crops. Some areas are used for small grain. A few areas are used for hay, pasture, or woodland.

This unit is well suited to corn, soybeans, and small grain. It is fairly well suited to tobacco. Wetness is a major limitation. If the soils are adequately drained, row crops can be grown in most years. Cover crops and a conservation tillage system that leaves protective amounts of crop residue on the surface help maintain the organic matter content and tilth.

This unit is well suited to grasses and legumes such as orchardgrass and red clover for hay and pasture. It is fairly well suited to alfalfa and other deep-rooted legumes that are tolerant of a seasonal high water table. Overgrazing and grazing when the soils are too wet cause surface compaction and poor tilth. Rotation grazing, proper stocking rates, deferred grazing, and restricted use during wet periods will keep the pasture and the soil in good condition.

This unit is well suited to trees. Plant competition and the equipment limitation are the major concerns. Harvesting and planting are often delayed by wetness. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees or shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This unit is severely limited as a site for dwellings because of wetness. A subsurface drainage system and raised, well compacted fill material can help overcome the wetness. The soils are severely limited as sites for local roads and streets because of low strength and potential frost action. Well compacted fill material and adequate side ditches and culverts will help protect the roads from frost damage. Strengthening or replacing the base material with better suited material improves the suitability for supporting vehicular traffic. This unit is severely limited as a site for septic tank absorption fields because of the wetness and the moderately slow permeability in the substratum. Interceptor subsurface drains at the perimeter of the field will lower the water table. Filling or mounding the absorption field with suitable fill material and elevating the field will help minimize the permeability problem.

The land capability classification is IIw. The woodland ordination symbol assigned to the Fincastle soil is 4A, and that assigned to the Reesville soil is 4W.

FxC3—Fox complex, 6 to 15 percent slopes, severely eroded. This unit consists of moderately sloping, well drained soils on side slopes on river terraces. The soils are moderately deep to sand and gravel. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. The unit is about 45 percent severely eroded Fox gravelly sandy clay loam and 35 percent eroded Fox loam. The two Fox soils occur as areas so intricately mixed or so small that it was not practical to map them separately. Areas are long and narrow and are 3 to 12 acres in size. The dominant size is about 8 acres. Slopes are 50 to 150 feet in length.

Typically, the surface layer of Fox gravelly sandy clay loam is dark brown and about 6 inches thick. The subsoil is about 19 inches thick. It is dark brown and firm. It is gravelly sandy clay loam in the upper part and gravelly sandy loam in the lower part. The part of the substratum between depths of 25 and 29 inches is light yellowish brown gravelly loamy coarse sand. The part at a depth of 29 to more than 60 inches is pale brown gravelly coarse sand. In some areas the thickness of the surface layer and subsoil is less than 24 inches. In a few small areas the subsoil is less clayey. In places, there is less gravel or the surface layer is very gravelly coarse sandy loam. In a few places slopes are more than 15 percent or less than 6 percent.

Typically, the surface layer of Fox loam is brown and about 6 inches thick. The subsoil is about 19 inches thick. It is brown and firm. It is gravelly sandy clay loam in the upper part and gravelly sandy loam in the lower part. The substratum extends to a depth of 60 inches or more. Between depths of 25 and 39 inches, it is light yellowish brown gravelly loamy coarse sand. At a depth of more than 39 inches, it is pale brown gravelly coarse sand.

Included with these soils in mapping are areas of well drained Eldean soils on the less sloping ridgetops. These included soils are more clayey than the Fox soils. Also included are excessively drained Rodman soils on narrow escarpments and some areas where sand and gravel are exposed on the more severely eroded parts of the landscape. Included soils make up about 20 percent of the map unit.

Available water capacity in these Fox soils is low. Permeability is moderate in the subsoil and rapid in the substratum. The organic matter content of the surface layer is low. Surface runoff from cultivated areas is rapid. The surface layer is neutral. It is firm and is cloddy when tilled outside the proper moisture content. Root

development is limited by the loose sand and gravel in the substratum. The shrink-swell potential is moderate

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture

These soils are poorly suited to corn, soybeans, and smal grain because of the slope, the low available water capacity, and a hazard of further erosion. The soils are very droughty in years when rainfall is low during the growing season. Grasses and legumes in the crop rotation, contour farming, and a conservation tillage system that leaves protective amounts of crop residue on the surface help prevent excessive erosion, increase the available water capacity, and conserve moisture. The soil is well suited to no-till farming. Cover crops help control erosion and improve or maintain tilth and the organic matter content

These soils are fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. Overgrazing and droughtiness in years of low rainfall are management concerns. Overgrazing causes surface compaction, excessive surface runoff, poor tilth, and poor stands. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture in good condition.

These soils are well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

These soils are moderately limited as sites for dwellings with basements because of the slope and as sites for dwellings without basements because of the slope and the shrink-swell potential. Special design helps to overcome the slope. Replacing the more clayey layers of the soil with suitable material helps to overcome the shrink-swell potential. The soils are severely limited as sites for local roads and streets because of low strength, frost action, shrinking and swelling, and slope. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. The soils are severely limited as sites for septic tank absorption fields because a poor filtering capacity in the substratum can result in the pollution of ground water Filling or mounding the absorption field with suitable material will improve the filtering capacity.

The land capability classification is IVe. The woodland ordination symbol is 4A.

Gd—Gessie loam, sandy substratum, rarely flooded. This nearly level, deep, well drained soil is on broad, high flood plains along the Whitewater River and its major tributaries. The soil is subject to rare flooding. Since the Brookville Reservoir has been operational, many areas below the dam have not been flooded. A few areas are protected by levees. The areas of this soil are long and narrow and are 4 to 250 acres in size The dominant size is about 30 acres.

Typically, the surface layer is dark brown loam about 9 inches thick. The substratum extends to a depth of 60 inches or more. To a depth of 45 inches, it is dark brown and brown loam and sandy loam. Between depths of 45 and 52 inches, it is brown sandy loam. At a depth of more than 52 inches, it is pale brown loamy sand and sand. In places the substratum has layers that are not calcareous. In some areas, the surface layer is darker or the soil is not sandy or gravelly within a depth of 60 inches. Some areas are occasionally flooded.

Available water capacity in this Gessie soil is high. Permeability is moderate in the upper part of the soil and rapid in the lower part. The organic matter content of the surface layer is moderately low Surface runoff is slow The surface layer is dominantly mildly alkaline. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture A few areas are wooded

This soil is well suited to corn, soybeans, tobacco, and small grain. A conservation tillage system that leaves protective amounts of crop residue on the surface will maintain tilth and the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. Overgrazing causes surface compaction and poor tilth Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods will help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings because of flooding. It is moderately limited as a site for local roads because of potential frost action and flooding. Raised, well compacted fill material and side ditches and culverts will help protect the roads from flooding and frost damage. This soil is moderately limited as a site for septic tank absorption fields because of the flooding and the moderate permeability

The land capability classification is I. The woodland ordination symbol is 8A.

Ge—Gessie loam, sandy substratum, occasionally flooded. This nearly level, deep, well drained soil is on broad flood plains along the Whitewater River and its major tributaries. The soil is occasionally flooded for brief periods from December to June. Areas are long and narrow and are 3 to 1,000 acres in size. The dominant size is about 100 acres.

Typically, the surface layer is dark brown loam about 10 inches thick. The substratum extends to a depth of 60 inches or more. To a depth of 44 inches, it is dark yellowish brown silt loam and loam. At a depth of more than 44 inches, it is yellowish brown loamy coarse sand. In places the substratum has layers that are not calcareous. In some other places, the surface layer is darker or the soil is not sandy or gravelly.

Available water capacity in this Gessie soil is high. Permeability is moderate in the upper part of the soil and rapid in the lower part. The organic matter content of the surface layer is moderately low. Surface runoff is slow. The surface layer is mildly alkaline. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture. Some areas are used for woodland.

This soil is well suited to corn, soybeans, and tobacco, but it is poorly suited to winter wheat because of spring and winter flooding. Levees help to protect crops from flooding. A conservation tillage system that leaves protective amounts of crop residue on the surface will protect the soil from crusting after heavy rains and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. Some legumes, however, can be damaged by flooding. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods will help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities and is severely limited as a site for local roads. Raised, well compacted fill material and adequate side ditches and culverts will help protect the roads from flood damage.

The land capability classification is IIw. The woodland ordination symbol is 8A.

HeG—Hennepin loam, 25 to 60 percent slopes. This steep and very steep, deep, well drained soil is on hillsides on uplands. Areas are long and narrow and are 2 to 30 acres in size. The dominant size is about 10 acres. Slopes are 75 to 300 feet in length.

Typically, the surface layer is dark brown loam about 7 inches thick. The subsoil is yellowish brown, firm loam about 8 inches thick. The substratum to a depth of 60 inches is yellowish brown loam. In a few places the subsoil is 50 inches thick and is more clayey. In some areas slopes are less than 25 percent.

Included with this soil in mapping are a few areas of well drained Miami soils on narrow ridgetops. These soils are more clayey than the Hennepin soil. They make up about 12 percent of the map unit.

Available water capacity in this Hennepin soil is moderate. Permeability is moderate in the subsoil and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is very rapid. The surface layer is mildly alkaline and friable. Root development is limited because the substratum is very firm till. The shrink-swell potential is moderate.

Most areas are wooded. A few areas are used for hay and pasture. Because of the slope, this soil is generally unsuited to cultivated crops and to hay and is poorly suited to grasses and legumes for pasture. Pasture renovation and management with conventional farming equipment is difficult. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Erosion is a hazard, and the use of equipment, especially crawler and rubber-tire tractors, is limited. Special operations, such as yarding logs uphill with a cable, are often needed. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the slope, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields and is severely limited as a site for local roads. The roads should be built on the contour. Land shaping and retaining walls may be needed. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic.

The land capability classification is VIIe. The woodland ordination symbol is 5R.

Ht—Holton silt loam, occasionally flooded. This nearly level, deep, somewhat poorly drained soil is in swales on flood plains. It is occasionally flooded for very brief periods from November to June. Areas are irregular in shape and are 3 to 15 acres in size. The dominant size is about 10 acres.

Typically, the surface layer is dark grayish brown silt loam about 11 inches thick. The subsoil is about 27 inches thick. It is grayish brown and brown, mottled, friable silt loam in the upper part and grayish brown and light brownish gray, mottled, friable loam and very friable sandy loam in the lower part. The substratum to a depth of 60 inches or more is gray and dark gray, mottled sandy loam and loam. In some areas the surface layer

and subsoil are more than 40 inches thick. In places there are calcareous layers in the subsoil or loamy sand and sand in the substratum. In a few places bedrock is at a depth of 20 to 60 inches.

Included with this soil in mapping are small areas of the moderately well drained Oldenburg soils. Also included are a few small areas of very poorly drained, dark alluvial soils in depressions. Included soils make up about 9 percent of the map unit.

Available water capacity in this Holton soil is high. Permeability is moderate. The organic matter content of the surface layer is moderately low. Surface runoff is slow. This soil has a water table at a depth of 1 to 3 feet during winter and spring. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. A few areas are used for small grain, hay, or pasture. Some areas are used for woodland.

If adequately drained, generally by a subsurface drainage system, this soil is fairly well suited to corn, soybeans, and small grain other than wheat. Spring and winter flooding is a major hazard, and wetness is a major limitation. A conservation tillage system that leaves protective amounts of crop residue on the surface and cover crops will help to maintain the organic matter content and tilth.

This soil is well suited to grasses and water-tolerant legumes for hay and pasture. It is poorly suited to deep-rooted legumes, such as alfalfa, because of the high water table. Overgrazing or grazing when the soil is wet or flooded causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods will help keep the pasture in good condition.

This soil is well suited to trees, especially water-tolerant species. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees or shrubs. Harvesting and planting often are delayed because of wetness. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and septic tank absorption fields. Flooding and frost action are severe limitations if the soil is used as a site for local roads. Raised, well compacted fill material and side ditches and culverts will help protect the roads from flooding and frost damage.

The land capability classification is IIIw. The woodland ordination symbol is 5A.

MmB2—Miami silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on ridgetops and hillsides on uplands. Areas are irregular in shape and are 2 to 25 acres in size. The dominant size is about 7 acres. Slopes are 50 to 300 feet in length.

Typically, the surface layer is brown silt loam about 8 inches thick. It has specks of yellowish brown subsoil material. The subsoil is about 26 inches thick. It is yellowish brown, firm clay loam in the upper part and brown, firm loam in the lower part. The substratum to a depth of 60 inches or more is pale brown loam. In places slopes are more than 6 percent or less than 2 percent. In a few places, the substratum is more clayey or bedrock is at a depth of about 35 inches. In a few areas the soil has more than 18 inches of loess.

Included with this soil in mapping are a few areas of moderately well drained Williamstown and Xenia soils around summits and the head of drainageways. Also included are small areas of colluvial soils in minor drainageways. Included soils make up about 7 percent of the map unit.

Available water capacity in this Miami soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is medium. The surface layer is dominantly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the firm subsoil. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard. A crop rotation which includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion (fig. 7). The soil is well suited to no-till farming. Cover crops help control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling. Properly designing foundations and footings and backfilling around basement walls with coarse material will help to prevent the structural damage caused by shrinking and swelling.

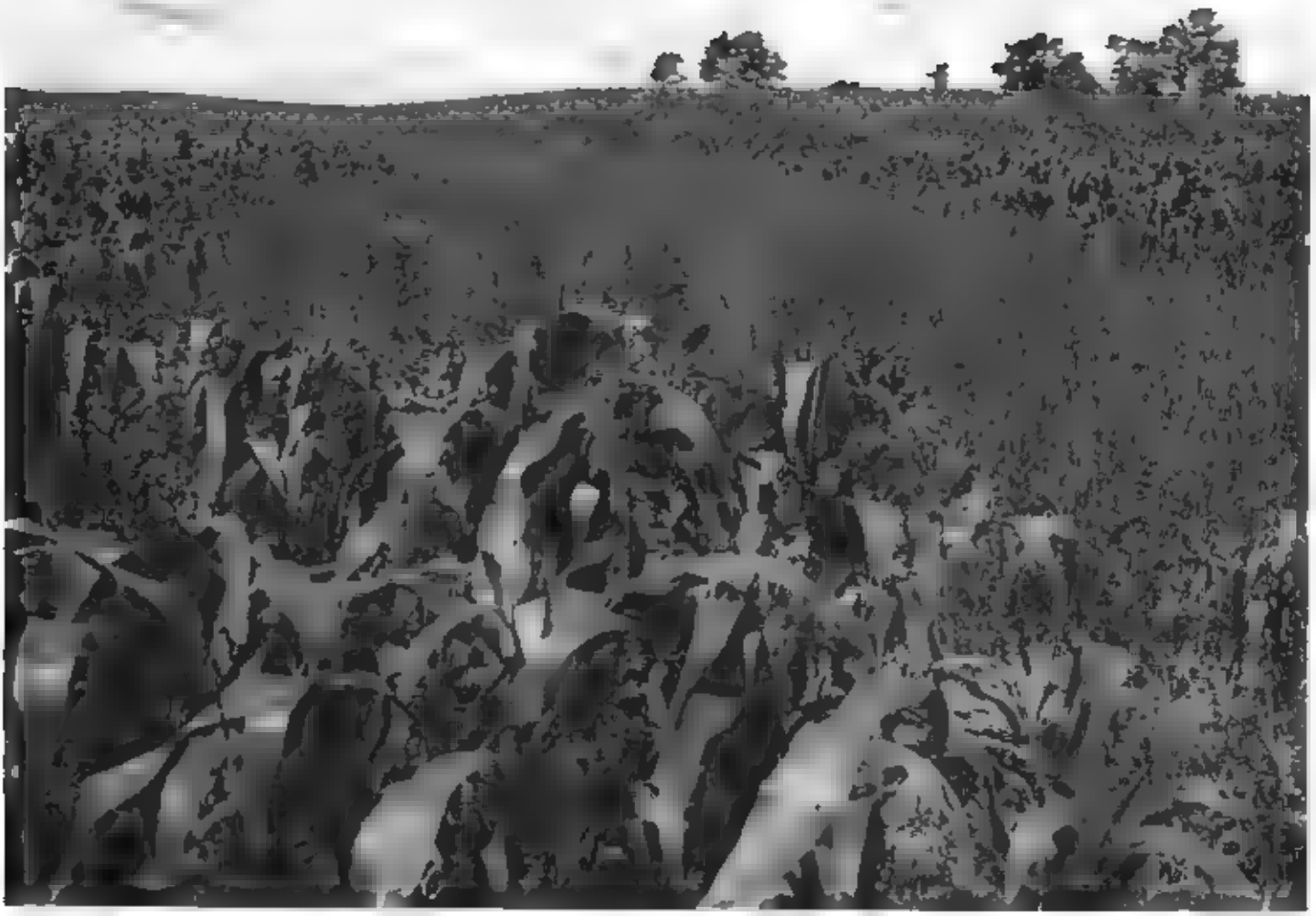

Figure 7.—A grassed waterway on Miami silt loam, 2 to 6 percent slopes, eroded.

This soil is moderately limited as a site for local roads and streets because of the shrinking and swelling and the potential for frost action. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and side ditches and culverts will help to protect the roads from frost damage. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability of the substratum. Filling or mounding the absorption field with suitable material, elevating the field, and enlarging the field will minimize the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 5A.

MmC2—Miami silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, deep, well drained soil is on hillsides and ridgetops on uplands. Areas are irregular in shape and are 3 to 60 acres in size. The dominant size is about 25 acres. Slopes are 60 to 400 feet in length.

Typically, the surface layer is dark brown silt loam about 8 inches thick. It has specks of yellowish brown subsoil material. The subsoil is about 22 inches thick. It is yellowish brown and firm. It is silty clay loam in the upper part and clay loam in the lower part. The substratum to a depth of 60 inches or more is light yellowish brown loam. In places slopes are less than 6 percent or more than 12 percent. In some areas the

depth to bedrock is less than 60 inches. In a few places the thickness of the surface layer and subsoil is more than 40 inches or less than 24 inches. In some other places the upper part of the soil is sandy loam or sandy clay loam.

Included with this soil in mapping are a few areas of moderately well drained Xenia soils around summits and drainageways. Also included are small areas of colluvial soils in drainageways. Included soils make up about 7 percent of the map unit.

Available water capacity in this Miami soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is medium. The surface layer is dominantly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the firm subsoil. The shrink-swell potential is moderate.

Some areas of this soil are used for cultivated crops or small grain. Other areas are used for hay and pasture or for woodland.

This soil is fairly well suited to corn, soybeans, and small grain. Erosion is a severe hazard. A conservation tillage system that leaves protective amounts of crop residue on the surface, a crop rotation which includes grasses and legumes, diversions, contour farming, grassed waterways, and grade stabilization structures help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help control erosion and improve or maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of the slope and the shrink-swell potential. Properly designing foundations and footings and backfilling around basement walls with coarse material will help to prevent the structural damage caused by shrinking and swelling. Establishing diversion terraces and grassed waterways, disturbing the soil as little as possible during construction, and planting grasses as soon as possible will reduce erosion. Sediment basins help to control siltation. The soil is moderately limited as a site for local roads and streets because of potential frost action, shrinking and swelling, and the slope. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and side ditches and culverts will help protect the roads from frost damage. Constructing the roads on the contour and land shaping help to overcome the slope. This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability of the substratum. Filling or mounding the absorption field with suitable material and elevating the field will minimize the permeability problem.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

MmD2—Miami silt loam, 12 to 18 percent slopes, eroded. This strongly sloping, deep, well drained soil is on hillsides on uplands. Areas are long and narrow and are 2 to 20 acres in size. The dominant size is about 10 acres. Slopes are 50 to 200 feet in length.

Typically, the surface layer is very dark grayish brown silt loam about 5 inches thick. The subsurface layer is brown silt loam about 4 inches thick. The subsoil is yellowish brown and dark yellowish brown, firm clay loam about 19 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown loam. In some areas slopes are more than 18 percent or less than 12 percent. In places the depth to the substratum is less than 24 inches. In some other places the depth to bedrock is less than 60 inches.

Included with this soil in mapping are narrow areas of well drained Hennepin soils on the steeper slopes. These soils make up about 6 percent of the map unit.

Available water capacity in this Miami soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is rapid. The surface layer is medium acid unless limed. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is restricted because the substratum is firm till.

Most areas of this soil are used for woodland. Some areas are used for hay or pasture. A few areas are used for cultivated crops.

This soil is poorly suited to corn, soybeans, and small grain. Erosion is a very severe hazard. A conservation tillage system that leaves protective amounts of crop residue on the surface, a crop rotation which includes grasses and legumes, and cover crops help to prevent excessive erosion and maintain tilth and the organic matter content. The soil is well suited to no-till farming.

This soil is fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet

periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve quality of the woodland.

This soil is severely limited as a site for dwellings and for local roads and streets because of the slope. Disturbing the soil as little as possible during construction helps to control erosion on building sites. Sediment basins help to prevent siltation of streams. Buildings should be designed so that they conform to the natural slope of the land, and local roads should be built on the contour. Land shaping may be needed. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability of the substratum and the slope. Enlarging the absorption field minimizes the permeability problem. The distribution lines should be installed on the contour.

The land capability classification is IVe. The woodland ordination symbol is 5A.

MoC3—Miami clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, deep, well drained soil is on hillsides on uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Areas are irregular in shape and are 3 to 80 acres in size. The dominant size is about 20 acres. Slopes are 60 to 400 feet in length.

Typically, the surface layer is dark yellowish brown clay loam about 5 inches thick. The subsoil is about 19 inches of yellowish brown, firm clay loam and loam. The substratum to a depth of 60 inches or more is pale brown loam. In places the thickness of the surface layer and subsoil is less than 24 inches. In a few places, calcareous till is at the surface or the soil is less eroded and is less clayey in the surface layer. In some other places, slopes are less than 6 percent or more than 12 percent or bedrock is at a depth of about 38 inches.

Available water capacity is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is low. Surface runoff is rapid. The surface layer is dominantly slightly acid. It is firm and commonly is cloddy. Root development is limited because the substratum is firm till. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops or small grain. A few areas are used for hay and pasture, for woodland, or for wildlife habitat.

This soil is poorly suited to cultivated crops or small grain. Erosion is a severe hazard. A conservation tillage system that leaves protective amounts of crop residue on the surface, crop rotations that include grasses and legumes, contour farming, grassed waterways, and grade stabilization structures help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help control erosion and help maintain tilth and the organic matter content.

This soil is fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of the slope and the shrink-swell potential. Properly designing foundations and footings and backfilling around basement walls with coarse material will help to prevent the structural damage caused by shrinking and swelling. Establishing diversion terraces and grassed waterways, disturbing the soil as little as possible during construction, and planting grasses as soon as possible will reduce erosion. Sediment basins help to control siltation. The soil is moderately limited as a site for local roads and streets because of potential frost action, shrinking and swelling, and the slope. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and side ditches and culverts will help protect the roads from frost damage. Constructing the roads on the contour and land shaping help to overcome the slope. This soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability of the substratum. Filling or mounding the absorption field with suitable material and elevating the field minimize the permeability problem.

The land capability classification is IVe. The woodland ordination symbol is 5A.

MoD3—Miami clay loam, 12 to 18 percent slopes, severely eroded. This strongly sloping, deep, well drained soil is on hillsides on uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Areas are elongated and are 3 to 25 acres in size. The dominant size is about 10 acres. Slopes range from 50 to 200 feet in length.

Typically, the surface layer is brown clay loam about 4 inches thick. The subsoil is about 18 inches thick. It is

yellowish brown and brown, firm clay loam in the upper part and dark yellowish brown, firm loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam. In a few places the thickness of the surface layer and the subsoil is more than 24 inches. In some other places, calcareous till is at the surface or the soil is less eroded and is less clayey in the surface layer. Some areas have slopes of more than 18 percent or less than 12 percent. In a few places bedrock is at a depth of about 36 inches.

Included with this soil in mapping are small areas of well drained Hennepin soils on the steeper slopes. These soils make up about 5 percent of the map unit.

Available water capacity in this Miami soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is low. Surface runoff is rapid. The surface layer is dominantly slightly acid. It is firm and commonly is cloddy. Root development is limited because the substratum is firm till. The shrink-swell potential is moderate.

Some areas are used for cultivated crops. Other areas are used for pasture, hay, or woodland. This soil is generally unsuited to corn and soybeans and is poorly suited to grasses and legumes for hay and pasture because of the slope and a severe hazard of further erosion. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods will help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings and for local roads and streets because of the slope. Disturbing the soil as little as possible during construction helps to control erosion at building sites. Sediment basins help to prevent siltation of streams. Buildings should be designed so that they conform to the natural slope of the land, and local roads should be built on the contour. Land shaping may be needed. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability of the substratum and the slope. Enlarging the absorption field minimizes the permeability problem. The distribution lines should be installed on the contour.

The land capability classification is VIe. The woodland ordination symbol is 5A.

Mr—Milford silty clay loam. This nearly level, deep, very poorly drained soil is in depressions in lakebeds that are on uplands and river terraces. It is frequently ponded for long periods by surface runoff from higher areas. Most areas are circular and are 5 to 25 acres in size. Slopes are 0 to 1 percent.

Typically, the surface layer is very dark gray silty clay loam about 9 inches thick. The subsurface layer is very dark gray silty clay about 5 inches thick. The subsoil is about 32 inches thick. It is mottled and firm. It is dark gray and light brownish gray silty clay in the upper part and light brownish gray and gray silt loam in the lower part. The substratum to a depth of 60 inches or more is gray and dark gray, mottled, stratified silt loam.

Included with this soil in mapping are small areas of the poorly drained Cyclone soils at the edges of the depressions. These soils make up about 15 percent of the map unit.

Available water capacity in this Milford soil is high. Permeability is moderately slow. The organic matter content in the surface layer is high. Surface runoff is very slow or ponded. A seasonal high water table is near or above the surface from winter to spring. The surface layer is neutral. It is firm and can be tilled only within a narrow range in moisture content. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture or for wildlife habitat.

If adequately drained, this soil is well suited to cultivated crops. Excess water can be removed by subsurface drains, surface drains, or open ditches or by a combination of those practices. Suitable outlets for a subsurface drainage system are not readily available, however, because the soil is in low areas. A conservation tillage system that leaves protective amounts of crop residue on the surface and tillage within the proper moisture content help maintain tilth and the organic matter content. The soil is well suited to fall plowing.

If adequately drained, this soil is well suited to grasses and legumes for hay or pasture. Most deep-rooted legumes are poorly suited, however, because of the seasonal high water table. Grazing when the soil is wet or overgrazing causes surface compaction and poor tilth. Overgrazing also reduces plant density and hardiness. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods will minimize surface compaction and maintain good tilth and plant density.

The soil is generally unsuitable as a site for dwellings and sanitary facilities because of ponding. The soil is severely limited as a site for local roads because of potential frost action, low strength, and ponding. Raised, well compacted fill material and side ditches and culverts will protect the roads from ponding and frost damage. Strengthening or replacing the base material with a more

suitable material improves the suitability for supporting vehicular traffic

The land capability classification is IIw. No woodland ordination symbol is assigned.

Mt—Moundhaven sandy loam, rarely flooded. This nearly level, deep, somewhat excessively drained soil is on the higher flood plains along the Whitewater River and its major tributaries. The soil is subject to rare flooding. Since the Brookville Reservoir became operational, many areas below the dam have not been flooded. Areas are broad and elongated and are 5 to 250 acres in size. The dominant size is about 60 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is brown sandy loam about 10 inches thick. The substratum to a depth of 60 inches or more is stratified brown and pale brown loamy sand and sand having strata of sandy loam and silt loam. In places, the surface layer is fine sandy loam or there is less sand in the substratum. In a few places the soil has a darker surface layer and more rock fragments in the substratum.

Available water capacity is low. Permeability is rapid. The organic matter content of the surface layer is moderately low. Surface runoff is slow. The surface layer is dominantly mildly alkaline. It is friable and can be tilled throughout a wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. Some areas are used for hay and pasture or for woodland.

This soil is fairly well suited to corn, soybeans, tobacco, and small grain, but it is droughty. A conservation tillage system that leaves protective amounts of crop residue on the surface will help conserve moisture. The soil is well suited to no-till farming. Cover crops maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. Overgrazing causes surface compaction, poor tilth, and reduced stand density. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are the main concerns. Harvesting methods that do not leave trees standing alone or widely spaced help to overcome the windthrow hazard. Seedling mortality can be reduced by removing forest litter from the soil just prior to the time when seeds are dropped from desirable trees. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling of unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and is moderately limited as a site for local roads. Raised, well compacted fill material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of a poor filtering capacity, which can result in the pollution of ground water. Filling or mounding the absorption field with suitable material will improve the filtering capacity.

The land capability classification is IIIs. The woodland ordination symbol is 4S.

Mx—Moundhaven sandy loam, occasionally flooded. This nearly level, deep, somewhat excessively drained soil is on flood plains. It is occasionally flooded for brief periods from December to June. Areas are broad and elongated and are 5 to 250 acres in size. The dominant size is about 60 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is brown sandy loam about 14 inches thick. The substratum to a depth of 60 inches or more is stratified dark yellowish brown, yellowish brown, and light yellowish brown loamy sand and sand having strata of sandy loam and silt loam. In places there is less sand in the substratum. In some other places the surface layer is fine sandy loam. In a few areas, the surface layer is darker and there are more rock fragments in the substratum.

Available water capacity is low. Permeability is rapid. The organic matter content of the surface layer is moderately low. Surface runoff is slow. The surface layer is dominantly mildly alkaline. It is friable and can be tilled throughout a wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture or for woodland.

This soil is fairly well suited to corn, soybeans, and tobacco, but it is droughty. It is poorly suited to winter wheat because of spring and winter flooding. A conservation tillage system that leaves protective amounts of crop residue on the surface will help conserve moisture. The soil is well suited to no-till farming. Cover crops maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes for hay and pasture. Some legumes are affected by flooding. Overgrazing causes surface compaction, poor tilth, and reduced stand density. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Seedling mortality, the windthrow hazard, and plant competition are the main concerns. Special harvesting methods that leave some mature trees to provide shade and protection will help to reduce seedling mortality. Harvesting methods that will not leave trees standing

alone or widely spaced help to overcome the windthrow hazard. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling of unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities and is severely limited as a site for local roads. Raised, well compacted fill material, roadside drainage ditches, and culverts will help protect the roads from flooding.

The land capability classification is IIIw. The woodland ordination symbol is 4S.

OcA—Ockley loam, 0 to 2 percent slopes. This nearly level, deep, well drained soil is on river terraces. Areas are irregular in shape and are 4 to 80 acres in size. The dominant size is about 25 acres. Slopes are 50 to 400 feet in length.

Typically, the surface layer is dark brown loam about 12 inches thick. The subsoil is about 34 inches thick. It is yellowish brown, firm clay loam in the upper part; dark yellowish brown, firm clay loam in the next part; and dark yellowish brown and dark brown, firm gravelly clay loam in the lower part. The part of the substratum between depths of 46 and 54 inches is yellowish brown gravelly loamy coarse sand. The part from a depth of 54 inches to 60 inches or more is brown gravelly coarse sand that has lenses of coarse sand. In some areas, the depth to sand and gravel is less than 40 inches or the upper part of the substratum is sandy loam, gravelly sandy loam, and very gravelly sandy loam. In places the subsoil contains less clay, more sand, and less gravel. The slope in some areas is more than 2 percent. In places the surface layer is very dark grayish brown.

Available water capacity is moderate. Permeability is moderate above the substratum and very rapid in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is slow. Root development is limited by the sand and gravel in the substratum. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture.

This soil is well suited to corn, soybeans, tobacco, and small grain, but it is droughty in years when rainfall is low during the growing season. A conservation tillage system that leaves a protective amount of crop residue on the surface and cover crops help improve tilth, the available water capacity, and the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. The major management concerns are overgrazing and droughtiness in years of low rainfall. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling. Special design of foundations and footings helps to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength and the shrinking and swelling. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. The soil is slightly limited as a site for septic tank absorption fields.

The land capability classification is I. The woodland ordination symbol is 5A.

OcB2—Ockley loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on river terraces. Areas are irregular in shape and are 3 to 20 acres in size. The dominant size is about 10 acres. Slopes are 50 to 150 feet in length.

Typically, the surface layer is dark brown loam about 9 inches thick. The subsoil is dark brown and firm and is about 36 inches thick. It is clay loam in the upper part and gravelly clay loam in the lower part. The substratum to a depth of 60 inches or more is pale brown gravelly coarse sand. In places the depth to sand and gravel is less than 40 inches. Some areas have as much as 15 percent gravel on the surface. In some other areas the upper part of the substratum is sandy loam, gravelly sandy loam, and very gravelly sandy loam. Slopes in some areas are more than 6 percent or less than 2 percent. In places, the subsoil contains less clay, more sand, and less gravel or the surface layer is very dark grayish brown.

Available water capacity is moderate. Permeability is moderate above the substratum and very rapid in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is medium. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the sand and gravel in the substratum.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard, and the soil is droughty in years when rainfall is low during the growing season. Grasses and legumes in the cropping system and a

conservation tillage system that leaves protective amounts of crop residue on the surface help to control erosion in cultivated areas. The soil is well suited to no-till farming. Cover crops help to control erosion and maintain tilth and the organic matter content. Conservation tillage and cover crops help conserve moisture during periods of low rainfall.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. The major management concerns are overgrazing and droughtiness in years of low rainfall. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees or shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling. Special design of foundations and footings helps to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of low strength and the shrinking and swelling. Strengthening or replacing the loose material with a more suitable material improves the suitability for supporting vehicular traffic. The soil is slightly limited as a site for septic tank absorption fields.

The land capability classification is IIe. The woodland ordination symbol is 5A.

Og—Oldenburg silt loam, occasionally flooded. This nearly level, deep, moderately well drained soil is in areas of slight swells and swales on flood plains. It is occasionally flooded for very brief periods from January to June. Areas are somewhat narrow and irregular in shape and are 3 to 15 acres in size. The dominant size is about 8 acres. Slopes range from 0 to 2 percent.

Typically, the surface layer is dark brown silt loam about 9 inches thick. The subsoil is about 30 inches thick. It is dark brown, friable silt loam in the upper part and brown, mottled, friable loam in the lower part. The substratum to a depth of 60 inches or more is brown, mottled loam and sandy loam. In a few places the surface layer and subsoil have up to 10 percent gravel. In a few other places bedrock is at a depth of 20 to 60 inches.

Included with this soil in mapping are small areas of well drained Wirt soils in the higher positions on the flood plains and somewhat poorly drained Holton soils in the lower positions. Also included are soils with loamy sand and sand in the substratum. Included soils make up about 15 percent of the map unit.

Available water capacity in this Oldenburg soil is high. Permeability is moderate. The organic matter content of the surface layer is moderately low. Surface runoff is slow. A seasonal high water table is at a depth of 2 to 4 feet during the winter and early spring. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture or for woodland.

This soil is well suited to corn, soybeans, and small grain, but it is poorly suited to wheat because of spring and winter flooding. Improving surface and subsurface drainage in low areas is a major concern. A conservation tillage system that leaves protective amounts of crop residue on the surface and cover crops will help to maintain the organic matter content and tilth. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. Overgrazing or grazing when the soil is wet or flooded causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods will help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees or shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities and is severely limited as a site for local roads. Raised, well compacted fill material, roadside drainage ditches and culverts will help protect the roads from flooding.

The land capability classification is IIw. The woodland ordination symbol is 5A.

Pg—Pits, gravel. This map unit consists of areas from which sand and gravel have been removed. These areas are on river terraces. They are circular and are 3 to 40 acres in size. The dominant size is about 20 acres. The excavations are nearly level to steep and are mainly 20 to 40 feet deep.

Included in mapping are areas where the soil has been scraped or mixed around some of the pits. Also included is a landfill of refuse and loamy soil material. Included areas make up about 30 percent of the map unit.

Available water capacity in this unit is very low. Permeability is rapid. The organic matter content is very low.

Onsite investigation is needed to determine the suitability of this unit for farming or as a site for buildings, local roads and streets, and septic tank absorption fields.

No land capability classification or woodland ordination symbol is assigned.

Ph—Pits, quarries. This map unit consists of areas from which building and agricultural limestone has been removed. These areas are on uplands where hard limestone is close to the surface. Most have a bedrock floor and vertical sidewalls. Boulders and stones are on the floor. The areas are elongated and are 2 to 40 acres in size. The dominant size is about 10 acres.

Included in mapping are areas of overburden and water. Also included are small areas of the well drained Corydon and Bonnell soils on adjacent slopes. Included areas make up about 40 percent of the map unit.

Available water capacity in this unit is very low. The bedrock is nearly impervious. The organic matter content is very low.

Onsite investigation is needed to determine suitability of this unit for farming or as a site for buildings, local roads and streets, and septic tank absorption fields.

No land capability classification or woodland ordination symbol is assigned.

PrC—Princeton fine sandy loam, 4 to 12 percent slopes. This gently sloping and moderately sloping, deep, well drained soil is on ridgetops and hillsides in the uplands. Areas are narrow and elongated and are 5 to 50 acres in size. The dominant size is about 15 acres. Slopes range from 80 to 400 feet in length.

Typically, the surface layer is brown fine sandy loam about 5 inches thick. The subsoil is about 61 inches thick. It is dark yellowish brown and brown, friable sandy loam in the upper part; brown, firm sandy clay loam in the next part; and strong brown and dark yellowish brown, friable loamy sand, sand, and sandy loam in the lower part. The substratum to a depth of 70 inches or more is yellowish brown sand. In places the soil is underlain by limestone bedrock at a depth of 4 feet or more. In a few areas, the substratum is more clayey or there is more silt or less clay in the subsoil. Slopes in some areas are less than 4 percent or more than 12 percent.

Included with this soil in mapping are areas of the well drained Miami soils on hillsides and ridgetops. These soils are less sandy than the Princeton soil. They make up about 5 percent of the map unit.

Available water capacity in this Princeton soil is high. Permeability is moderate. The organic matter content of the surface layer is moderately low. Surface runoff is medium in cultivated areas. The surface layer is medium acid. It is friable and can be tilled throughout a wide range in moisture content. The shrink-swell potential is low.

Some areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are used for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard. A crop rotation which includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. Overgrazing will cause surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings and septic tank absorption fields because of slope. Buildings should be designed so that they conform to the natural slope of the land, and the distribution lines in septic tank absorption fields should be installed on the contour. Disturbing the soil as little as possible during construction helps to prevent excessive erosion. This soil is moderately limited as a site for local roads and streets because of potential frost action and slope. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Building the roads on the contour helps to overcome the slope.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

RkF—Rodman gravelly coarse sandy loam, 35 to 60 percent slopes. This very steep, excessively drained soil is on breaks and escarpments on river terraces. It is shallow to sand and gravel. Areas are long and narrow and are 4 to 60 acres in size. The dominant size is about 10 acres. Slopes are about 100 to 300 feet in length.

Typically, the surface layer is very dark grayish brown gravelly coarse sandy loam about 5 inches thick. The subsoil is yellowish brown, very friable gravelly coarse sandy loam about 9 inches thick. The substratum to a depth of 60 inches or more is brown very gravelly coarse sand that has lenses of coarse sand and fine sand. In places the surface layer is lighter colored. In some areas the subsoil and substratum contain more clay and silt. In some other areas slopes are less than 25 percent.

Available water capacity is very low. Permeability is very rapid. The organic matter content of the surface layer is moderate. Surface runoff is very rapid. The surface layer is neutral. Root development is limited by

the loose sand and gravel in the substratum. The shrink-swell potential is low

Most areas support trees, mainly hardwoods. Some areas are used for pasture. This soil is generally unsuited to cultivated crops and hay because of the slope and a severe hazard of erosion. It is poorly suited to grasses and legumes such as orchardgrass and alfalfa for pasture. A cover of grasses and legumes is effective in controlling erosion. Pasture renovation and maintenance are difficult because of the slope. Overgrazing causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Seedling mortality is high, erosion is a hazard, and the use of equipment is limited. Replanting of seedlings is often necessary, but established seedlings survive and grow well if erosion is controlled. Planting older, larger, or containerized seedlings is sometimes necessary to establish a stand. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Harvest methods that leave some mature trees to provide shade and protection help to establish seedlings. The use of crawler and rubber-tire tractors is generally unsafe because of the slope. Logs should be yarded uphill by a cable on some slopes. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the slope, this soil is generally unsuitable as a site for dwellings and sanitary facilities and is severely limited as a site for local roads. The roads should be built on the contour. Cutting and filling are needed.

The land capability classification is VIIs. The woodland ordination symbol is 4R

Rm—Ross silt loam, rarely flooded. This nearly level, deep, well drained soil is on flood plains. It is subject to rare flooding. In places it is protected by levees. Areas are irregularly shaped or circular and are 8 to 75 acres in size. The dominant size is about 20 acres.

Typically, the surface soil is very dark grayish brown silt loam about 24 inches thick. The subsoil is very dark grayish brown and dark brown, friable loam about 12 inches thick. The substratum to a depth of 60 inches is brown loam and sandy loam. In places, the surface soil is less than 24 inches thick or the surface layer is lighter colored. Some areas have up to 10 percent gravel on the surface and up to 30 percent gravel and channers in the subsoil.

Included with this soil in mapping are small areas of the well drained Gessie soils in the slightly higher positions on the flood plains. These soils are less clayey than the Ross soil. They make up about 5 percent of the map unit.

Available water capacity in this Ross soil is high. Permeability is moderate. The organic matter content of the surface layer is moderate. Surface runoff is slow The surface layer is neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low

Most areas of this soil are used for cultivated crops. A very few areas are used for hay, pasture, or woodland.

This soil is well suited to cultivated crops. A conservation tillage system that leaves protective amounts of crop residue on the surface helps maintain the organic matter content and tilth. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. Overgrazing causes surface compaction and poor tilth Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods will help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Competing vegetation can be controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is generally unsuitable as a site for dwellings because of flooding. It is moderately limited as a site for local roads and streets because of low strength, potential frost action, and flooding. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and side ditches and culverts will help protect the roads from frost and flood damage. This soil is moderately limited as a site for septic tank absorption fields because of flooding Dikes, levees, and surface drains are needed.

The land capability classification is I. The woodland ordination symbol is 5A.

RsA—Rossmoyne silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on ridgetops on uplands. Areas are irregular in shape and are 3 to 25 acres in size. The dominant size is about 10 acres. Slopes are 100 to 200 feet in length.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil extends to a depth of 80 inches. It is dominantly yellowish brown and is firm or very firm. It is silt loam in the upper part, mottled silt loam in the next part, a fragipan of silt loam in the next part, and loam in the lower part. In a few places slopes are more than 2 percent.

Included with this soil in mapping are small areas of the somewhat poorly drained Avonburg soils on slight swales. Included soils make up about 8 percent of the map unit.

Available water capacity in this Rossmoyne soil is moderate. Permeability is moderate above the fragipan

and slow in the fragipan. The organic matter content of the surface layer is moderately low. Surface runoff is slow. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet during winter and early spring. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development and water movement in this soil are restricted by the fragipan. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture or for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain, but it is droughty and thus limited for late-maturing crops. Crop residue management and cover crops help to maintain tilth and the organic matter content and improve the available water capacity during droughty periods. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. The fragipan limits most deep-rooted legumes. Most legume stands last for 1 to 3 years. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. The windthrow hazard, seedling mortality, and plant competition are the main concerns. Harvesting and thinning so that trees are not left standing alone or widely spaced will help to prevent windthrow. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Special equipment helps to prevent damage to the surficial root system. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings with basements because of wetness. It is moderately limited as a site for dwellings without basements because of wetness and shrinking and swelling. Backfilling along basement walls with coarse material will help reduce shrinking and swelling. A subsurface drainage system around footings helps to remove seepage water. This soil is severely limited as a site for local roads and streets because of the potential for frost action and low strength. Raised, well compacted fill material and side ditches and culverts will help remove excess water and protect the roads from frost action. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the slow permeability and the wetness. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem. Perimeter interceptor drains around the absorption field can lower the water table.

The land capability classification is IIw. The woodland ordination symbol is 3D.

RsB2—Rossmoyne silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on ridgetops and side slopes on uplands. Areas are irregular in shape and are 3 to 100 acres in size. The dominant size is about 25 acres. Slopes are 50 to 150 feet in length.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 68 inches thick. It is yellowish brown and brown and is firm or very firm. It is silt loam and mottled silty clay loam in the upper part; a fragipan of brittle silty clay loam, silt loam, and clay loam in the next part; and clay loam in the lower part. The substratum to a depth of 80 inches or more is yellowish brown clay loam. In a few areas the slope is less than 2 percent. In places the substratum is stratified.

Included with this soil in mapping are small areas of well drained Cincinnati soils on the steeper slopes. Also included are small areas of somewhat poorly drained Avonburg soils on the less sloping side slopes and ridges. Included soils make up 5 to 10 percent of the map unit.

Available water capacity in this Rossmoyne soil is moderate. Permeability is moderate above the fragipan and slow in the fragipan. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. A seasonal high water table is perched at a depth of 1.5 to 3.0 feet during winter and early spring. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development and water movement in this soil are limited by the fragipan. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture or for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain, but it is droughty and thus limited for late-maturing crops. A crop rotation that includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Crop residue management improves the available water capacity and helps maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and clover for hay and pasture. The fragipan limits most deep-rooted legumes. Most legume stands last for 1 to 3 years. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. The windthrow hazard, seedling mortality, and plant competition are the main

concerns. Harvesting and thinning so that trees are not left standing alone or widely spaced will help to prevent windthrow. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Special equipment helps to prevent damage to the surficial root system. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings with basements because of wetness. It is moderately limited as a site for dwellings without basements because of wetness and shrinking and swelling. Backfilling along basement walls with coarse material will help reduce shrinking and swelling. A subsurface drainage system around footings helps to remove seepage water. This soil is severely limited as a site for local roads and streets because of the potential for frost action and low strength. Raised, well compacted fill material and side ditches and culverts will help remove excess water and protect the roads from frost action. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the slow permeability and the wetness. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem. Perimeter interceptor drains around the absorption field can lower the water table.

The land capability classification is IIe. The woodland ordination symbol is 3D.

RuB2—Russell silt loam, 1 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on ridgetops and the upper side slopes on uplands. Areas are irregular in shape and are 2 to 30 acres in size. The dominant size is about 10 acres. Slopes are 50 to 150 feet in length.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 42 inches thick. It is yellowish brown, firm silty clay loam in the upper part and yellowish brown and brown, firm clay loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam. In a few places plowing has mixed the upper part of the subsoil with the surface layer. In places the soil has less than 20 or more than 40 inches of loess. In some other places the depth to bedrock is less than 60 inches.

Included with this soil in mapping are areas of moderately well drained Xenia soils on the upper side slopes and ridgetops. Included soils make up about 9 percent of the map unit.

Available water capacity in this Russell soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited because the substratum is very firm till. The shrink-swell potential is moderate.

Many areas of this soil are used for cultivated crops. Some areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard. A crop rotation which includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling. Properly designing foundations and footings and backfilling around basement walls with coarse material will help to prevent the structural damage caused by shrinking and swelling. The soil is moderately limited as a site for local roads and streets because of the shrinking and swelling and the potential for frost action. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and side ditches and culverts will help to protect the roads from frost damage. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability of the substratum. Filling or mounding the absorption field with suitable material, elevating the field, and enlarging the field will minimize the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 5A.

RvA—Russell silt loam, bedrock substratum, 0 to 2 percent slopes. This nearly level, deep, well drained soil is in plane or slightly convex areas on uplands. Areas are irregularly shaped or elongated and are 3 to 30 acres in size. The dominant size is about 15 acres. Slopes are 100 to 400 feet in length.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 43 inches thick. It is yellowish brown and dark yellowish brown and is firm. It is silty clay loam in the upper part, clay loam in the next part, and loam in the lower part. The substratum is light yellowish brown loam about 4 inches thick. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 54 inches. In some areas the soil has less than 20 inches of loess. In a few places the lower part of the subsoil and the substratum are the flaggy or stony analogs of clay loam or silty clay. In some other places the bedrock is at a depth of more than 60 inches or less than 40 inches.

Available water capacity is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content is moderately low. Surface runoff is slow from cultivated areas. A seasonal high water table is at a depth of 4 to 6 feet in late winter and early spring. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the substratum and the underlying bedrock. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture, and a few areas are used for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain. A conservation tillage system that leaves protective amounts of crop residue on the surface and cover crops help to improve tilth and the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture, but the bedrock limits the suitability for some very deep rooted legumes. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, pasture renovation, deferred grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings without basements because of shrinking and swelling. It is moderately limited as a site for dwellings with basements because of wetness and shrinking and swelling. Replacing the more clayey layers of the soil with suitable material and backfilling along foundations and basement walls with coarse material will help to prevent the structural damage caused by shrinking and swelling. Subsurface drains help lower the water table. The soil is severely limited as a site for local roads and streets because of potential frost action. Replacing or covering the upper layers of the soil with suitable base material helps to control frost action. This soil is limited as a site for septic tank absorption fields because of the moderately slow permeability and the depth to bedrock. Enlarging the absorption field and filling or mounding with suitable material help to overcome these limitations.

The land capability classification is 1. The woodland ordination symbol is 5A.

RvB—Russell silt loam, bedrock substratum, 2 to 6 percent slopes. This gently sloping, deep, well drained soil is on side slopes on uplands. Areas are irregular in shape or elongated and are 3 to 30 acres in size. The dominant size is about 15 acres. Slopes are 50 to 250 feet in length.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsoil is about 42 inches thick. It is yellowish brown and firm. It is silty clay loam in the upper part and clay loam and loam in the lower part. The substratum is light yellowish brown loam about 4 inches thick. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 53 inches. In places the soil has less than 20 inches of loess. In some areas the lower part of the subsoil and the substratum are the flaggy or stony analogs of clay loam or silty clay. In a few areas the bedrock is at a depth of more than 60 inches or less than 40 inches.

Available water capacity is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff is medium from cultivated areas. A seasonal high water table is at a depth of 4 to 6 feet in the early spring. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the substratum and the underlying bedrock. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few areas are used for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard. A crop rotation which includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture, but the bedrock limits the suitability for some very deep rooted legumes. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, pasture renovation, deferred

grazing, and restricted use during wet periods help to keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the wood and.

This soil is moderately limited as a site for dwellings without basements because of shrinking and swelling. It is moderately limited as a site for dwellings with basements because of wetness and shrinking and swelling. Replacing the more clayey layers of the soil with suitable material and backfilling along foundations and basement walls with coarse material help to prevent the structural damage caused by shrinking and swelling. Subsurface drains help lower the water table. The soil is severely limited as a site for local roads and streets because of potential frost action. Replacing or covering the upper layers of the soil with suitable base material helps to control frost action. This soil is limited as a site for septic tank absorption fields because of moderately slow permeability and the depth to bedrock. Enlarging the absorption field and filling or mounding with suitable material help to overcome these limitations.

The land capability classification is IIe. The woodland ordination symbol is 5A.

SdB—Sidell silt loam, 1 to 4 percent slopes. This gently sloping, deep, well drained soil is on foot slopes and in slight depressions on uplands. Areas are irregular in shape and are 5 to 80 acres in size. The dominant size is about 10 acres. Slopes are 100 to 600 feet in length.

Typically, the surface soil is very dark grayish brown silt loam about 16 inches thick. The subsoil is about 31 inches thick. It is dark yellowish brown and yellowish brown. It is firm silty clay loam in the upper part, friable silt loam in the next part, and firm loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown, mottled loam. In a few areas the surface soil is less than 10 inches thick. In places the upper part of the subsoil is neutral in reaction. In a few other places the soil has more than 40 inches of loess.

Included with this soil in mapping are areas of well drained Russell soils on the higher parts of the landscape. Also included are seepy spots. Included soils make up about 10 percent of the map unit.

Available water capacity of this Sidell soil is high. Permeability is moderate above the substratum and moderately slow in the substratum. The organic matter content of the surface layer is moderate. Surface runoff from cultivated fields is medium. The surface layer is neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited because the substratum is firm till. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard. A crop rotation which includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is moderately limited as a site for dwellings because of shrinking and swelling. Properly designing foundations and footings and backfilling around basement walls with coarse material will help to prevent the structural damage caused by shrinking and swelling. This soil is moderately limited as a site for local roads and streets because of the shrinking and swelling and the potential for frost action. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Raised, well compacted fill material and side ditches and culverts will help to protect the roads from frost damage. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability of the substratum. Filling or mounding the absorption field with suitable material, elevating the field, and enlarging the field will minimize the permeability problem.

The land capability classification is IIe. No woodland ordination symbol is assigned.

UaB—Uniontown silt loam, moderately wet, 2 to 8 percent slopes. This gently sloping, deep, moderately well drained soil is on ridgetops and hillsides on terraces. Areas are long and narrow or irregular in shape and are 3 to 25 acres in size. The dominant size is about 6 acres. Slopes are 50 to 250 feet in length.

Typically, the surface layer is dark brown silt loam about 8 inches thick. The subsoil is about 40 inches thick. It is brown, firm silt loam in the upper part; yellowish brown, firm silty clay loam and silt loam in the next part; and yellowish brown, mottled, firm silty clay loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown and light brownish gray, mottled, stratified silty clay loam and silt loam. In places the surface layer and subsoil are more than 48 inches thick. In some other places slopes are less than 2

percent or more than 8 percent. In a few places the soil is underlain by stratified sandy and loamy material.

Available water capacity is high. Permeability is moderate. The organic matter content of the surface layer is moderately low. Surface runoff is medium. A seasonal high water table is at a depth of 2.5 to 4.0 feet for short periods during late winter and early spring. The surface layer is neutral. It is friable and can be tilled throughout a wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. Some areas are used for hay or pasture. A few areas are wooded.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard. A crop rotation which includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is very effective in controlling erosion. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings with basements because of wetness. Drain tile helps prevent wet basements. The soil is severely limited as a site for local roads and streets because of low strength and potential frost action. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. Covering or replacing the upper layers of the soil with suitable coarse material will control frost action. This soil is severely limited as a site for septic tank absorption fields because of wetness. A perimeter interceptor drainage system will help lower the water table.

The land capability classification is IIe. The woodland ordination symbol is 6A.

UnD2—Uniontown silt loam, 15 to 25 percent slopes, eroded. This strongly sloping and moderately steep, deep, well drained soil is on side slopes on terraces. Areas are long and narrow or irregular in shape and are 3 to 20 acres in size. The dominant size is about 7 acres. Slopes are 50 to 150 feet in length.

Typically, the surface layer is brown silt loam about 6 inches thick. The subsoil is about 24 inches thick. It is yellowish brown and firm. It is silty clay loam in the upper part and silt loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown, mottled, stratified silt loam and silty clay loam. In places the surface layer and subsoil are less than 30 inches thick. In some other places slopes are more than 25 percent. In a few places there is silty clay in the subsoil and substratum.

Available water capacity is high. Permeability is moderate. The organic matter content of the surface layer is moderately low. Surface runoff is rapid. The surface layer dominantly is slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for pasture or woodland. A very few areas are used for cultivated crops or for hay.

This soil is poorly suited to corn, soybeans, and small grain. Erosion is a very severe hazard. A conservation tillage system that leaves protective amounts of crop residue on the surface, a crop rotation which includes grasses and legumes, and cover crops help to prevent excessive erosion, conserve moisture, and help to maintain tilth and the organic matter content. The soil is well suited to no-till farming.

This soil is fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture. A cover of grasses and legumes helps to control erosion. Overgrazing causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, timely deferment of grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is fairly well suited to trees. Plant competition, the erosion hazard, and the equipment limitation are the main concerns. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Placing roads, skid trails, and landings in the less sloping areas and using water bars, culverts, and drop structures help to control erosion. When the soil is wet, roads are slippery and ruts form quickly. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings and septic tank absorption fields because of slope. The buildings and absorption fields should be designed so that they conform to the natural slope of the land. Land shaping may be needed. Diversions, terraces, and grassed waterways between lots will help reduce erosion. Planting grasses as soon as possible after construction will help control erosion, and sediment basins help to control downstream silting. The soil is severely limited as a site for local roads and streets

because of slope and low strength. Special design helps to overcome the slope. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic.

The land capability classification is IVe. The woodland ordination symbol is 6R.

WeB2—Weisburg silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, well drained soil is on narrow ridges and on shoulder slopes of broad ridges on uplands. Areas are irregular in shape and are 10 to 60 acres in size. The dominant size is about 30 acres. Slopes are 50 to about 200 feet in length.

Typically, the surface layer is dark brown silt loam about 6 inches thick. The subsoil is about 66 inches thick. In sequence downward, it is yellowish brown, firm silt loam; a fragipan of yellowish brown, mottled, very firm silt loam and silty clay loam; yellowish brown, firm clay and silty clay; and yellowish brown, mottled, firm silty clay. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 72 inches. In places the depth to clayey residuum is more than 6 feet. In some other places, the lower part of the subsoil has less clay or the subsoil is clay loam. In some areas slopes are more than 6 percent.

Included with this soil in mapping are severely eroded areas that have a surface layer of silty clay loam. Also included, on the lower side slopes, are small areas of well drained Carmel soils. Included soils make up about 12 percent of the map unit.

Available water capacity in this Weisburg soil is moderate. Permeability is moderate above the fragipan and very slow in and below the fragipan. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. The surface layer dominantly is neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development and water movement in this soil are limited by the fragipan. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops. Some areas are used for hay and pasture (fig. 8) or for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain, but it is droughty in late summer. A conservation tillage system that leaves protective amounts of crop residue on the surface and a crop rotation that includes grasses and legumes will help to prevent excessive erosion and conserve moisture. The soil is well suited to no-till farming. Cover crops help control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture, but the dense fragipan limits deep-rooted legumes. Most legume stands last for 1 to 3 years. Overgrazing and grazing when the soil is wet cause surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for buildings with basements because of the shrink-swell potential. Strengthening foundations, footings, and basement walls and backfilling with coarse material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of potential frost action. Raised, well compacted fill material and road ditches and culverts will help protect the roads from frost damage. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the very slow permeability in and below the fragipan. Enlarging the absorption field minimizes the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 4A.

WmB—Williamstown silt loam, 1 to 4 percent slopes. This gently sloping, deep, moderately well drained soil is on ridgetops and side slopes in the uplands. Areas are irregular in shape and are 3 to 12 acres in size. Slopes are 40 to 150 feet in length.

Typically, the surface layer is brown silt loam about 8 inches thick. The subsoil is firm and mottled and is about 24 inches thick. It is dark yellowish brown and yellowish brown clay loam in the upper part and yellowish brown loam in the lower part. The substratum to a depth of 60 inches or more is pale brown, mottled loam. In a few places, the soil has more than 19 inches of loess and the surface layer and subsoil are more than 40 inches thick.

Included with this soil in mapping are small areas of somewhat poorly drained Fincastle soils on the less sloping swells. Also included are small areas of the well drained Miami soils, soils in which the substratum is more permeable, and severely eroded soils. Included soils make up about 11 percent of the map unit.

Available water capacity in this Williamstown soil is high. Permeability is moderate in the subsoil and moderately slow in the substratum. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. A seasonal high water table is at a depth of 1.5 to 3.5 feet during late winter and early spring. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a

Figure 8.—Red clover is a major legume on Weisburg silt loam, 2 to 6 percent slopes, eroded.

wide range in moisture content. Root development is limited because the substratum is very firm till. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. A few areas are used for hay and pasture or for woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain. A crop rotation that includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Protective amounts of crop residue on the surface and cover crops help maintain the organic matter content and tilth. A subsurface drainage system is needed in seepy spots in drainageways and on toe slopes.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture, but wetness limits the suitability for some deep-rooted legumes. Overgrazing and grazing when the soil is wet cause surface compaction, surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and

restricted use during wet periods help keep the pasture in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is severely limited as a site for dwellings with basements because of wetness. It is moderately limited as a site for dwellings without basements because of wetness and shrinking and swelling. Subsurface drains and footing drains help lower the water table. Properly designing foundations and footings and backfilling along footings and basement walls with coarse material will help to prevent the structural damage caused by shrinking and swelling. The soil has severe limitations as a site for local roads and streets because of low strength and potential frost action. Raised, well compacted fill material and side ditches and culverts will help protect the roads from frost damage. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. The soil has severe limitations as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Perimeter interceptor drains will help lower the water table. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 5A.

Wn—Wirt loam, occasionally flooded. This nearly level, deep, well drained soil is on flood plains. It is occasionally flooded very briefly during the period November to June. Areas are long and narrow and are 3 to 100 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is dark brown loam about 8 inches thick. The subsoil is brown, friable loam about 32 inches thick. The substratum to a depth of 60 inches or more is brown loam. In a few places the depth to the substratum is more than 40 inches. In some areas the subsoil is calcareous. In a few other areas, the substratum has strata of loamy sand and silt loam.

Included with this soil in mapping are small areas of moderately well drained Oldenburg soils in the slightly lower swales. Also included are areas that have bedrock at a depth of 20 to 60 inches. Included soils make up about 5 percent of the map unit.

Available water capacity in this Wirt soil is high. Permeability is moderate. The organic matter content of the surface layer is moderately low. Surface runoff is slow. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is low.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture, and a few are used for woodland.

This soil is well suited to cultivated crops, but the flooding is a major hazard. A conservation tillage system that leaves protective amounts of crop residue on the surface, green manure crops, and cover crops will help maintain the organic matter content and tilth. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes for hay and pasture, but the flooding is a hazard. Overgrazing causes surface compaction and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is severe. Competing vegetation can be controlled by site preparation, by special harvest methods, or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

Because of the flooding, this soil is generally unsuitable as a site for dwellings and sanitary facilities and is severely limited as a site for local roads. Raised, well compacted fill material and side ditches and culverts will help protect the roads from flooding.

The land capability classification is IIw. The woodland ordination symbol is 7A.

WoB—Woolper silty clay loam, 1 to 6 percent slopes. This gently sloping, deep, well drained soil is on foot slopes below steep hillsides on uplands. Areas are long and narrow and are 3 to 40 acres in size. The dominant size is about 15 acres. Slopes are 100 to 300 feet in length.

Typically, the surface layer is very dark grayish brown silty clay loam about 5 inches thick. The subsurface layer is dark brown silty clay loam about 4 inches thick. The subsoil to a depth of 60 inches or more is dark brown, brown, and dark yellowish brown, very firm and firm silty clay. In a few places, the surface layer is silty clay or there is less clay in the subsoil. In a few other places, the depth to bedrock is less than 60 inches or the soil is underlain by loamy outwash. Slopes in some areas are more than 6 percent.

Included with this soil in mapping are areas of moderately deep, well drained Eden soils on strongly sloping to very steep hillsides. These soils are more clayey than the Woolper soil. They make up about 5 percent of the map unit.

Available water capacity of this Woolper soil is high. Permeability is slow. The organic matter content of the surface layer is moderate. Surface runoff from cultivated fields is medium. The surface layer is neutral. It is firm and can be tilled only within a narrow moisture range

without becoming cloddy. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops or for hay and pasture. A few areas are used for woodland or wildlife habitat.

This soil is well suited to corn, soybeans, tobacco, and small grain. Erosion is a hazard. A conservation tillage system that leaves protective amounts of crop residue on the surface and a crop rotation that includes grasses and legumes will help prevent excessive erosion and conserve moisture. Tilling when the soil is at the proper moisture content minimizes compaction and helps to maintain tilth. Cover crops help to control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. Overgrazing and grazing when the soil is wet cause surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. The equipment limitation, seedling mortality, and plant competition are the major concerns. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. This soil is slippery when wet, and special equipment sometimes is needed. Controlling livestock helps prevent deterioration of the woodland. Harvesting mature trees and fostering the growth of seed trees improve the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling. Replacing the more clayey layers of the soil with suitable material, strengthening foundations, footings, and basement walls, and backfilling with coarse material will help prevent the structural damage caused by shrinking and swelling. This soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the slow permeability. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 4C.

WrB—Wynn silt loam, 1 to 6 percent slopes. This gently sloping, moderately deep, well drained soil is on ridgetops and hillsides on uplands. Areas are irregular in shape and are 3 to 30 acres in size. The dominant size is about 8 acres. Slopes range from 75 to 250 feet in length.

Typically, the surface layer is dark brown silt loam about 8 inches thick. It has specks of yellowish brown subsoil material. The subsoil is firm and is about 30 inches thick. It is brown and yellowish brown silt loam and silty clay loam in the upper part, dark yellowish brown clay loam in the next part, and olive brown silty clay in the lower part. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 38 inches. In places the soil has more than 22 inches of loess. In a few other places, the depth to bedrock is more than 40 inches or there is no glacial material in the subsoil. Slopes in some areas are more than 6 percent.

Included with this soil in mapping are small, narrow areas of colluvial soils in drainageways. These soils make up about 3 percent of the map unit.

Available water capacity in this Wynn soil is moderate. Permeability is slow. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is limited by the bedrock at a depth of 20 to 40 inches. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops. A few areas are used for hay, pasture, or woodland.

This soil is well suited to corn, soybeans, tobacco, and small grain, but it is droughty and thus limited for late-maturing crops. A crop rotation that includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Crop residue management improves the available water capacity and helps maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. The suitability for deep-rooted legumes is limited by the soft bedrock at a depth of 20 to 40 inches. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by special harvest methods, by site preparation, or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling. Additionally, the depth to bedrock is a moderate limitation on sites for dwellings with basements. The bedrock on these sites should be excavated. Special design of foundations and footings and replacement of the more clayey layers of the soil

with suitable soil material help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the depth to bedrock and the slow permeability. Excavation of the bedrock is needed in some areas. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 5A.

WrC2—Wynn silt loam, 6 to 12 percent slopes, eroded. This moderately sloping, moderately deep, well drained soil is on narrow ridgetops and hillsides on uplands. Areas are long and narrow and are 5 to 80 acres in size. The dominant size is about 20 acres. Slopes range from 75 to 350 feet in length.

Typically, the surface layer is dark yellowish brown silt loam about 7 inches thick. The subsoil is firm and is about 23 inches thick. It is yellowish brown silty clay loam in the upper part, yellowish brown clay loam in the next part, and light olive brown silty clay in the lower part. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 30 inches. In places the silty mantle is up to 26 inches thick. In a few areas the depth to bedrock is more than 40 inches or less than 20 inches. Slopes in some areas are less than 6 percent or more than 12 percent.

Included with this soil in mapping are severely eroded soils with a surface layer of silty clay loam or clay loam. These soils make up about 10 percent of the map unit.

Available water capacity of this Wynn soil is low. Permeability is slow. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. Root development is restricted by the bedrock at a depth of 20 to 40 inches. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops or for hay and pasture. A few areas are used for woodland or wildlife habitat.

This soil is fairly well suited to corn, soybeans, and small grain. The erosion hazard is severe. A conservation tillage system that leaves protective amounts of crop residue on the surface, a crop rotation which includes grasses and legumes, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Cover crops help to control erosion and maintain tilth and the organic matter content.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture. A cover of grasses and legumes is effective in controlling erosion. The suitability for deep-rooted legumes is limited by the bedrock at a depth of 20 to 40 inches. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by special harvest methods, by site preparation, or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling and the slope. The depth to bedrock also is a moderate limitation on sites for dwellings with basements. The bedrock on these sites should be excavated. Special design of foundations, footings, and basement walls and replacement of the more clayey layers of the soil with suitable material help to prevent the structural damage caused by shrinking and swelling. The buildings should be designed so that they conform to the natural slope of the land. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the depth to bedrock and the slow permeability. Excavation of the bedrock is needed in some areas. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem.

The land capability classification is IIIe. The woodland ordination symbol is 5A.

WyC3—Wynn silty clay loam, 6 to 12 percent slopes, severely eroded. This moderately sloping, moderately deep, well drained soil is on narrow ridgetops and hillsides on uplands. In most areas, nearly all of the original surface layer has been removed by erosion and tillage has mixed the rest with the upper part of the subsoil. Areas are long and narrow and are 5 to 80 acres in size. The dominant size is about 20 acres. Slopes range from 75 to 400 feet in length.

Typically, the surface layer is dark yellowish brown silty clay loam about 4 inches thick. The subsoil is about 17 inches thick. The upper part is dark yellowish brown, firm clay loam, and the lower part is light olive brown, firm silty clay. Interbedded, soft, calcareous shale and thin-bedded limestone bedrock are at a depth of about 21 inches. In a few places, the surface layer is clay loam or there is more sand and less clay in the subsoil. In some areas the depth to bedrock is less than 20 inches

or more than 40 inches. In some other areas, the slope is less than 6 percent or more than 12 percent or the soil is less eroded.

Included with this soil in mapping are a few areas of the well drained Miami soils at the head of drainageways. These soils are less clayey than the Wynn soil. They make up about 3 percent of the map unit.

Available water capacity of this Wynn soil is low. Permeability is slow. The organic matter content of the surface layer is low. Surface runoff from cultivated fields is rapid. The surface layer is dominantly neutral. It is firm and can be tilled only within a narrow moisture range without becoming cloddy. Root development is restricted by the bedrock at a depth of 20 to 40 inches. The shrink-swell potential is high.

Most areas of this soil are used for cultivated crops or for hay and pasture. A few areas are used for woodland or wildlife habitat.

This soil is poorly suited to corn, soybeans, and small grain because of a severe hazard of further erosion. A conservation tillage system that leaves protective amounts of crop residue on the surface, a crop rotation that includes grasses and legumes and cover crops, contour farming, and diversions help to control erosion and maintain tilth. The soil is well suited to no-till farming. Tilling at the proper moisture content minimizes surface compaction and improves tilth.

This soil is fairly well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. A cover of grasses and legumes is effective in controlling erosion. The suitability for deep-rooted legumes is limited by the bedrock at a depth of 20 to 40 inches. Overgrazing or grazing when the soil is wet causes surface compaction, excessive runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition, the windthrow hazard, seedling mortality, and the equipment limitation are management concerns. Harvesting so that trees are not standing alone or widely spaced helps to control windthrow. Seedlings survive and grow well if competing vegetation is controlled by special harvest methods, by site preparation, and by cutting, spraying, or girdling unwanted trees and shrubs. Planting containerized seedlings increases the seedling survival rate. When the soil is wet, roads are slippery and ruts form quickly. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings because of shrinking and swelling and the slope. The depth to bedrock also is a moderate limitation on sites for dwellings with basements. The bedrock on these sites should be excavated. Special design of foundations, footings, and basement walls and replacement of the more clayey layers of the soil with suitable material help to prevent the structural damage caused by shrinking and swelling. The buildings should be designed so that they conform to the natural slope of the land. The soil is severely limited as a site for local roads and streets because of low strength. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. This soil is severely limited as a site for septic tank absorption fields because of the depth to bedrock and the slow permeability. Excavation of the bedrock is needed in some areas. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem.

The land capability classification is IVe. The woodland ordination symbol is 4C.

XnA—Xenia silt loam, 0 to 2 percent slopes. This nearly level, deep, moderately well drained soil is on broad ridgetops on uplands. Areas are generally oval and are 3 to 30 acres in size. The dominant size is about 15 acres.

Typically, the surface layer is brown silt loam about 7 inches thick. The subsurface layer is also brown silt loam. It is about 5 inches thick. The subsoil is yellowish brown and is about 36 inches thick. It is friable silty clay loam in the upper part, mottled, firm silty clay loam in the next part, and firm clay loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam. In places the substratum is more permeable. In a few places bedrock is within a depth of 60 inches. Slopes in a few areas are more than 2 percent.

Included with this soil in mapping are areas of somewhat poorly drained Fincastle soils and well drained Russell soils. Included soils make up about 6 percent of the map unit.

Available water capacity in this Xenia soil is high. Permeability is moderately slow. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is slow. A seasonal high water table is at a depth of 2 to 6 feet in early spring. The surface layer is dominantly slightly acid. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. A few areas are used for hay and pasture or are wooded.

This soil is well suited to corn, soybeans, tobacco, and small grain. Crop residue management and cover crops help maintain tilth and the organic matter content. The soil is well suited to no-till farming.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay or pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing,

and restricted use during wet periods help keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation or by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings without basements because of shrinking and swelling and the wetness. It is severely limited as a site for dwellings with basements because of the wetness. Foundation drains help to lower the water table. Specially designing foundations and footings and backfilling with coarse material will help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of potential frost action and low strength. Raised, well compacted fill material and side ditches and culverts will help protect the roads from frost damage. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Perimeter interceptor drains around the absorption field will help lower the water table. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem.

The land capability classification is I. The woodland ordination symbol is 5A.

XnB2—Xenia silt loam, 2 to 6 percent slopes, eroded. This gently sloping, deep, moderately well drained soil is on ridgetops and side slopes on uplands. Areas are irregular in shape and are 3 to 50 acres in size. The dominant size is about 15 acres. Slopes are 50 to 400 feet in length.

Typically, the surface layer is brown silt loam about 9 inches thick. The subsoil is yellowish brown and is about 36 inches thick. It is mottled, firm silty clay loam in the upper part, firm clay loam in the next part, and mottled, firm loam in the lower part. The substratum to a depth of 60 inches or more is yellowish brown loam. In places the substratum is more permeable. Slopes in some areas are less than 2 percent. In a few places, the layers above the substratum are thinner or bedrock is within a depth of 60 inches.

Included with this soil in mapping are small areas of somewhat poorly drained Fincastle soils and well drained Russell soils. Also included are small areas of somewhat poorly drained colluvial soils in drainageways. Included soils make up about 12 percent of the map unit.

Available water capacity in this Xenia soil is high. Permeability is moderately slow. The organic matter content of the surface layer is moderately low. Surface runoff from cultivated areas is medium. A seasonal high water table is at a depth of 2 to 6 feet in early spring. The surface layer is dominantly neutral. It is friable and can be tilled throughout a fairly wide range in moisture content. The shrink-swell potential is moderate.

Most areas of this soil are used for cultivated crops. A few areas are used for hay or pasture, and a few are wooded.

This soil is well suited to corn, soybeans, tobacco, and small grain. A crop rotation that includes grasses and legumes, a conservation tillage system that leaves protective amounts of crop residue on the surface, contour farming, and grassed waterways help prevent excessive erosion. The soil is well suited to no-till farming. Protective amounts of crop residue on the surface and cover crops help maintain the organic matter content and tilth. A subsurface drainage system is needed in seepy spots in drainageways and on toe slopes.

This soil is well suited to grasses and legumes such as orchardgrass and alfalfa for hay and pasture. Overgrazing or grazing when the soil is wet causes surface compaction, excessive surface runoff, and poor tilth. Proper stocking rates, rotation grazing, deferred grazing, and restricted use during wet periods help to keep the pasture and the soil in good condition.

This soil is well suited to trees. Plant competition is moderate. Seedlings survive and grow well if competing vegetation is controlled by site preparation and by spraying, cutting, or girdling unwanted trees and shrubs. Controlling livestock, harvesting mature trees, and fostering the growth of seed trees improve the quality of the woodland.

This soil is moderately limited as a site for dwellings without basements because of shrinking and swelling and the wetness. It is severely limited as a site for dwellings with basements because of the wetness. Foundation drains help to lower the water table. Specially designing foundations and footings and backfilling with coarse material will help to prevent the structural damage caused by shrinking and swelling. The soil is severely limited as a site for local roads and streets because of potential frost action and low strength. Raised, well compacted fill material and side ditches and culverts will help protect the roads from frost damage. Strengthening or replacing the base material with a more suitable material improves the suitability for supporting vehicular traffic. The soil is severely limited as a site for septic tank absorption fields because of the moderately slow permeability and the wetness. Perimeter interceptor drains around the absorption field will help lower the water table. Enlarging the absorption field, filling or mounding the field with suitable material, and elevating the field will minimize the permeability problem.

The land capability classification is IIe. The woodland ordination symbol is 5A.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is the land that is best suited to food, feed, forage, fiber, and oilseed crops. It may be cultivated land, pasture, woodland, or other land, but it is not urban and built-up land or water areas. It either is used for food or fiber crops or is available for those crops. The soil qualities, growing season, and moisture supply are those needed for a well managed soil to produce a sustained high yield of crops in an economic manner. Prime farmland produces the highest yields with minimal inputs of energy and economic resources, and farming it results in the least damage to the environment.

Prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation. The temperature and growing season are favorable. The level of acidity or alkalinity is acceptable. Prime farmland has few or no rocks and is permeable to water and air. It is not excessively erodible or saturated with water for long periods and is not frequently flooded during the growing season. The slope ranges mainly from 0 to 6 percent. More detailed information about the criteria for prime farmland is available at the local office of the Soil Conservation Service.

In Franklin County 115,759 acres, or about 46 percent of the total acreage, meets the requirements for prime farmland. About 65 percent of this land is used for corn, 25 percent for soybeans, and 10 percent for wheat or for rotation pasture and hay. Crops grown on prime farmland account for nearly all the county's agricultural income each year.

A recent trend in land use in some parts of the county has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in table 5. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 4. The location is shown on the detailed soil maps at the back of this publication. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Some soils that have a seasonal high water table qualify for prime farmland only in areas where this limitation has been overcome by such drainage measures. The need for these measures is indicated after the map unit name in table 5. Onsite evaluation is needed to determine whether or not this limitation has been overcome by corrective measures.

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Gary Maners, district conservationist, Soil Conservation Service, helped prepare this section.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

About 155,000 acres of Franklin County was used for crops and pasture in 1980. Of this, 71,000 acres was used for row crops, mainly corn; 8,000 acres was used for close-growing crops, mainly winter wheat, oats, and barley; and 11,500 acres was used for permanent hay. The rest was idle or was used for conservation purposes (*5*).

The paragraphs that follow describe the main concerns in managing the soils in the county for crops and pasture. These concerns are wetness, erosion, and fertility.

Wetness is the major concern on about 50,000 acres of the cropland and pasture in the county. Artificial drainage is adequate on most soils in the Cyclone-Fincastle-Reesville and Fincastle-Xenia-Cyclone associations, which are described under the heading "General Soil Map Units." Most areas of the Avonburg-Cobbsfork association are not adequately drained. Draining the Cobbsfork soils is difficult. As a result of the wetness, many areas do not produce high yields. In some areas adequate outlets are not readily available. Group drainage projects are needed to provide a drainage main or outlet for large areas. If the poorly drained and somewhat poorly drained soils are not artificially drained, the crops on them are damaged in some years.

A combination of surface and subsurface drainage systems is needed on somewhat poorly drained to very poorly drained soils. A subsurface drainage system is effective in Fincastle, Reesville, Cyclone, and Milford soils. The need for a surface drainage system is occasional on Cyclone soils and constant on Milford soils. Avonburg and Cobbsfork are examples of soils where a surface drainage system is needed and where long-term use of subsurface drains may result in siltation of the drains. Specific design information is available at the local office of the Soil Conservation Service.

Erosion is the major hazard on about 60 percent of the cropland and pasture in the county. It is a hazard if

slopes are 1.5 percent or more. Erosion results in poorer stands of crops and loss of water, fertilizer, and chemicals beneficial to the crop. It also causes sedimentation and chemical pollution in drainageways.

Erosion in nearly level to moderately sloping areas can be controlled by crop rotations that include grasses and legumes, conservation tillage, or cover crops or by a combination of these measures. A permanent grass cover is needed on some of the steeper slopes. Terracing and contouring can help to control erosion in some areas but are not suitable for soils with an uneven, undulating topography. Terraces, grassed waterways, and water- and sediment-control basins are common methods of controlling gully erosion. Diversions are used in some areas to protect the nearly level, lower fields from excessive runoff from the steeper adjoining slopes.

Fertility is affected greatly by past land use. Erosion and a failure to replace needed plant nutrients have resulted in very low fertility in some areas of the county. Lime and fertilizer needs should be determined for individual fields by soil fertility testing methods. The Cooperative Extension Service can determine the amount of lime and fertilizer needed for specific crops.

The field crops that are suited to the soils and climate in the county include many that are not commonly grown. Some examples are grass seed from bromegrass, orchardgrass, tall fescue, redtop, bluegrass, ryegrass, and seed corn. Corn, soybeans, and grain sorghum are the chief row crops. Wheat, barley, and oats are the chief close-growing crops. Tobacco is grown in some areas (fig. 9). It is a high-value, labor-intensive crop. The legumes that are suited to the soils in this county are clover, alfalfa, and lespedeza. The grasses that are suitable for hay or pasture are tall fescue, orchardgrass, bromegrass, timothy, and bluegrass.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of each map unit also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils are generally grouped at three levels: capability class, subclass, and unit. Only class and subclass are used in this survey.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows.

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Figure 9.—Tobacco on Geeslo loam, sandy substratum, occasionally flooded.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e*, *w*, *s*, or *c*, to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class V contains only the subclasses indicated by *w*, *s*, or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation.

The acreage of soils in each capability class and subclass is shown in table 7. The capability classification of each map unit is given in the section "Detailed Soil Map Units" and in the yields table.

Woodland Management and Productivity

Michael D. Warner, forester, Soil Conservation Service, helped prepare this section

Table 8 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for an indicator tree species. The number indicates the volume, in cubic meters per hectare per year, which the indicator species can produce. The number 1 indicates low potential productivity; 2 and 3, moderate; 4 and 5, moderately high; 6 to 8, high; 9 to 11, very high; and 12 to 39, extremely high. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *R* indicates steep slopes; *X*, stoniness or rockiness; *W*, excess water in or on the soil; *T*, toxic substances in the soil; *D*, restricted rooting depth; *C*, clay in the upper part of the soil; *S*, sandy texture; *F*, a high content of rock fragments in the soil; and *L*, low strength. The letter *A* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: R, X, W, T, D, C, S, F, and L.

In table 8, *slight*, *moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Erosion hazard is the probability that damage will occur as a result of site preparation and cutting where the soil is exposed along roads, skid trails, fire lanes, and log-handling areas. Forests that have been burned or overgrazed are also subject to erosion. Ratings of the erosion hazard are based on the percent of the slope. A rating of *slight* indicates that no particular prevention measures are needed under ordinary conditions. A rating of *moderate* indicates that erosion-control measures are needed in certain silvicultural activities. A rating of *severe* indicates that special precautions are needed to control erosion in most silvicultural activities.

Equipment limitation reflects the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. The chief characteristics and conditions considered in the ratings are slope, stones on the surface, rock outcrops, soil wetness, and texture of the surface layer. A rating of *slight* indicates that under normal conditions the kind of equipment or season of use is not significantly restricted by soil factors. Soil wetness can restrict equipment use, but the wet period does not exceed 1 month. A rating of *moderate* indicates that equipment use is moderately restricted because of one or more soil factors. If the soil is wet, the wetness restricts equipment use for a period of 1 to 3 months. A rating of *severe* indicates that equipment use is severely restricted either as to the kind of equipment that can be used or the season of use. If the soil is wet, the wetness restricts equipment use for more than 3 months.

Seedling mortality refers to the death of naturally occurring or planted tree seedlings, as influenced by the kinds of soil, soil wetness, or topographic conditions. The factors used in rating the soils for seedling mortality are texture of the surface layer, depth to a seasonal high water table and the length of the period when the water table is high, rock fragments in the surface layer, effective rooting depth, and slope aspect. A rating of *slight* indicates that seedling mortality is not likely to be a problem under normal conditions. Expected mortality is less than 25 percent. A rating of *moderate* indicates that some problems from seedling mortality can be expected. Extra precautions are advisable. Expected mortality is 25 to 50 percent. A rating of *severe* indicates that seedling mortality is a serious problem. Extra precautions are important. Replanting may be necessary. Expected mortality is more than 50 percent.

Windthrow hazard is the likelihood that trees will be uprooted by the wind because the soil is not deep enough for adequate root anchorage. The main restrictions that affect rooting are a seasonal high water table and the depth to bedrock, a fragipan, or other limiting layers. A rating of *slight* indicates that under normal conditions no trees are blown down by the wind. Strong winds may damage trees, but they do not uproot them. A rating of *moderate* indicates that some trees can be blown down during periods when the soil is wet and winds are moderate or strong. A rating of *severe* indicates that many trees can be blown down during these periods.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index* and as a *volume* number. The site index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *volume*, a number, is the yield likely to be produced by the most important trees. This number, expressed as cubic feet per acre per year, indicates the amount of fiber produced on a fully stocked, even-aged, unmanaged stand.

The first species listed under *common trees* for a soil is the indicator species for that soil. It is the dominant species on the soil and the one that determines the ordination class.

Trees to plant are those that are suitable for commercial wood production.

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, help to keep snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To ensure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Table 9 shows the height that locally grown trees and shrubs are expected to reach in 20 years on various soils. The estimates in table 9 are based on measurements and observation of established plantings that have been given adequate care. They can be used as a guide in planning windbreaks and screens. Additional information on planning windbreaks and screens and planting and caring for trees and shrubs can be obtained from local offices of the Soil Conservation Service or the Cooperative Extension Service or from a commercial nursery.

Recreation

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 13 and interpretations for dwellings without basements and for local roads and streets in table 12.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

James D. McCall, biologist, Soil Conservation Service, helped prepare this section.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate

vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 11, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, soybeans, wheat, oats, rye, sunflowers, and sorghum.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are timothy, bluegrass, orchardgrass, bromegrass, lespedeza, redtop, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are dandelion, goldenrod, beggarweed, foxtail, and broom sedge.

Hardwood trees and woody understory produce nuts or other fruit, buds, catkins, twigs, bark, and foliage. Soil properties and features that affect the growth of hardwood trees and shrubs are depth of the root zone, available water capacity, and wetness. Examples of these plants are maple, beech, oak, hickory, wild cherry, poplar, apple, hawthorn, dogwood, blackberry, and elderberry. Examples of fruit-producing shrubs that are suitable for planting on soils rated *good* are Russian-olive, autumn-olive, crabapple, and shrub dogwood.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pine, spruce, fir, cedar, and juniper.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, cattails, rushes, sedges, and reeds.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include bobwhite quail, killdeer, meadowlark, field sparrow, cottontail rabbit, dove, groundhog, and red fox.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, ruffed grouse, woodcock, thrushes, woodpeckers, squirrels, gray fox, raccoon, and white-tailed deer.

Habitat for wetland wildlife consists of marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, muskrat, mink, and beaver.

Edge habitat consists of areas where major land uses or cover types adjoin. A good example is the border between dense woodland and a field of no-till corn. Although not rated in the table, edge habitat is of primary importance to animals from the smallest songbirds to white-tailed deer. Most of the animals that inhabit

openland or woodland also frequent edge habitat, and desirable edge areas are consistently used by 10 times as many wildlife as are the centers of large areas of woodland or cropland.

Engineering

Max L. Evans, state conservation engineer, Soil Conservation Service, helped prepare this section

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 12 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, slope, and flooding affect the ease of excavation

and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 13 shows the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 13 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 13 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage due to rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground

water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 13 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to soil blowing.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 14 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a *probable* or *improbable* source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 14, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation

of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 15 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations, and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of soil blowing or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a

cemented pan affect the construction of grassed waterways. A hazard of soil blowing, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

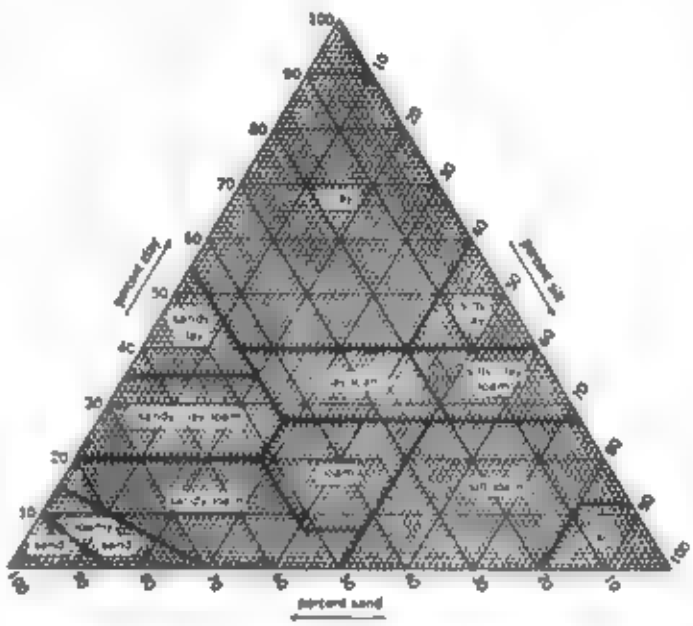

Figure 10.—Percentages of clay, silt, and sand in the basic USDA soil textural classes.

Engineering Index Properties

Table 16 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter (fig. 10). "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as about 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of

grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 17 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3 bar moisture tension. Weight is determined after drying the soil at 105 degrees C. In this table, the estimated moist bulk density of each major soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters in diameter. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. A bulk density of more than 1.6 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to

buildings, roads, and other structures. Special design is often needed

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity The change is based on the soil fraction less than 2 millimeters in diameter The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter (up to 4 percent) and on soil structure and permeability. Values of K range from 0.05 to 0.69. The higher the value, the more susceptible the soil is to sheet and rill erosion by water

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to soil blowing in cultivated areas. The groups indicate the susceptibility to soil blowing. Soils are grouped according to the following distinctions.

1. Sands, coarse sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish
2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control soil blowing are used.
3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control soil blowing are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control soil blowing are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible Crops can be grown if measures to control soil blowing are used.
5. Loamy soils that are less than 20 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control soil blowing are used.
6. Loamy soils that are 20 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.
7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown
8. Stony or gravelly soils and other soils not subject to soil blowing.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 17, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 18 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are.

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to two hydrologic groups in table 18, the first letter is for drained areas and the second is for undrained areas.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 18 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as *none*, *rare*, *occasional*, and *frequent*. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *occasional* that it occurs, on the average, once or less in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 18 are the depth to the seasonal high water table; the kind of water table—that is, perched or apparent; and the months of the year that the water table commonly is high. A water table that is seasonally high for less than 1 month is not indicated in table 18.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower one by a dry zone.

Only saturated zones within a depth of about 6 feet are indicated. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. The first numeral in the range indicates how high the water rises above the surface. The second numeral indicates the depth below the surface.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are the most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*7*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 19 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Udalf (*Ud*, meaning humid, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Hapludalfs (*Hapl*, meaning minimal horizonation, plus *udalf*, the suborder of the Alfisols that has a udic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Hapludalfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-silty, mixed, mesic Typic Hapludalfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in soil color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*6*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*7*). Unless otherwise stated, colors in the descriptions are for moist soil. Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Alvin Series

The Alvin series consists of deep, well drained soils on river terraces. The soils are moderately permeable in the subsoil and moderately rapidly permeable in the substratum. They formed in loamy and sandy outwash. Slopes range from 0 to 6 percent.

Alvin soils are similar to Princeton soils and are commonly adjacent to excessively drained Rodman soils. The Princeton soils have a more clayey B horizon than the Alvin soils, and the Rodman soils have more gravel in the B horizon and are steeper.

Typical pedon of Alvin sandy loam, 0 to 2 percent slopes, in a cultivated field; 400 feet west and 2,200 feet north of the southeast corner of sec. 32, T. 9 N., R. 2 W.

Ap—0 to 10 inches; dark brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary.

Bt1—10 to 18 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; friable; thin discontinuous brown (10YR 4/3) clay films on faces of peds; neutral; clear smooth boundary.

Bt2—18 to 33 inches; yellowish brown (10YR 5/6) loam; moderate coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear smooth boundary.

Bt3—33 to 39 inches; yellowish brown (10YR 5/6) loam; moderate medium subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear smooth boundary.

BC—39 to 46 inches; yellowish brown (10YR 5/6) fine sandy loam; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

C—46 to 60 inches; light yellowish brown (10YR 6/4) loamy fine sand; single grain; very friable; strong effervescence; mildly alkaline.

The solum is at least 40 inches thick. The Ap horizon is sandy loam or fine sandy loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is loam, sandy clay loam, or fine sandy loam and is neutral to medium acid. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. It is loamy fine sand, loamy sand, or fine sand.

Avonburg Series

The Avonburg series consists of deep, somewhat poorly drained soils on uplands. These soils have a fragipan. Permeability is moderate above the fragipan and very slow in and below the fragipan. The soils formed in loess and silty glacial drift. Slopes range from 0 to 2 percent.

Avonburg soils are commonly adjacent to poorly drained Cobbsfork soils and moderately well drained Rossmoyne soils. The Cobbsfork soils do not have a fragipan, are grayer than the Avonburg soils, and are in the center of large flats. The Rossmoyne soils do not have grayish mottles in the subsurface layer or the upper part of the subsoil and are on side slopes and narrow ridgetops.

Typical pedon of Avonburg silt loam, 0 to 2 percent slopes, in an area of brushy woods; 1,760 feet west and 150 feet south of the northeast corner of sec. 17, T. 10 N., R. 12 E.

Ap—0 to 8 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; many fine and very fine roots; few fine black (10YR 2/1) accumulations of iron and manganese oxide; very strongly acid; abrupt smooth boundary.

E—8 to 11 inches; grayish brown (10YR 5/2) silt loam; common fine faint pale brown (10YR 6/3) mottles; moderate medium platy structure parting to moderate medium granular; friable; many fine and very fine roots; common fine black (10YR 2/1) accumulations of iron and manganese oxide; extremely acid; clear smooth boundary.

Btg—11 to 15 inches; grayish brown (10YR 5/2) silty clay loam; many fine prominent yellowish brown (10YR 5/6) mottles; moderate fine subangular blocky structure; firm; many fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; common fine black (10YR 2/1) accumulations of iron and manganese oxide; extremely acid; clear wavy boundary.

Bt—15 to 21 inches; yellowish brown (10YR 5/4) silty clay loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; few fine black (10YR 2/1) accumulations of iron and manganese oxide; extremely acid; clear wavy boundary.

Btx1—21 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; many fine prominent grayish brown (10YR 5/2) mottles; strong coarse prismatic structure; very firm; brittle; many fine flattened roots along prism walls; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous gray (10YR 6/1) silt films on prism caps and walls; few fine black (10YR 2/1) accumulations of iron and manganese oxide; extremely acid; clear wavy boundary.

Btx2—28 to 45 inches; yellowish brown (10YR 5/6) silt loam; common fine prominent light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure parting to moderate thick platy; very firm; brittle; common medium and fine flattened roots along prism walls; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds and pores; thick continuous gray (10YR 6/1) silt films on faces of peds; common fine black (10YR 2/1) accumulations of iron and manganese oxide; extremely acid; gradual wavy boundary.

2Btx3—45 to 75 inches; yellowish brown (10YR 5/6) silt loam; common fine prominent gray (10YR 6/1) mottles; strong very coarse prismatic structure; very firm; brittle; few medium flattened roots along prism walls; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous gray (10YR 6/1) silt films on prism walls; common fine

black (10YR 2/1) accumulations of iron and manganese oxide; extremely acid; gradual wavy boundary

2BC—75 to 80 inches; yellowish brown (10YR 5/6) silt loam containing noticeable sand; common fine prominent gray (10YR 6/1) mottles; weak coarse subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thick discontinuous gray (10YR 6/1) silt films on faces of peds; extremely acid.

The solum is more than 80 inches thick. The loess is 40 to 48 inches thick. The underlying silty glacial drift extends to a depth of 80 inches or more. The depth to the fragipan ranges from 21 to 28 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 1 to 6. It is silt loam or silty clay loam and is extremely acid to strongly acid. The Btx and 2Btx horizons are similar in color, texture, and reaction. The 2Btx horizon is more than 15 percent very fine sand or coarser material. The 2BC horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 to 6 and is extremely acid to slightly acid.

Bonnell Series

The Bonnell series consists of deep, well drained, slowly permeable soils on uplands. The soils formed in loamy glacial till or in a thin mantle of loess and the underlying loamy glacial till. Slopes range from 6 to 50 percent.

Bonnell soils are similar to Edenton and Wynn soils and are commonly adjacent to well drained Carmel, Cincinnati, and Edenton soils. The Edenton and Wynn soils have a thinner solum than the Bonnell soils and formed partly in material weathered from paralithic bedrock. The Carmel soils formed dominantly in clayey material weathered from paralithic bedrock. They are in the lower landscape positions. The Cincinnati soils have a fragipan, have a thicker loess mantle than the Bonnell soils, and are less sloping.

Typical pedon of Bonnell silt loam, 18 to 25 percent slopes, eroded, in a pasture; 530 feet east and 1,530 feet south of the northwest corner of sec. 11, T. 11 N., R. 12 E.

Ap—0 to 6 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary

Bt1—6 to 21 inches; yellowish brown (10YR 5/6) clay; moderate fine and medium subangular blocky structure; firm; thin continuous yellowish brown (10YR 5/4) clay films on faces of peds; medium acid; clear wavy boundary

Bt2—21 to 42 inches; yellowish brown (10YR 5/6) clay loam; moderate medium and coarse subangular blocky structure; firm; thin continuous yellowish brown (10YR 5/4) clay films on faces of peds; slightly acid; clear wavy boundary

BC—42 to 50 inches; yellowish brown (10YR 5/6) loam; few medium prominent grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; few fine black (10YR 2/1) accumulations of iron and manganese oxide; neutral; gradual wavy boundary.

C—50 to 60 inches; yellowish brown (10YR 5/4) loam; moderate medium platy rock structure; very firm; strong effervescence; mildly alkaline.

The solum is 50 to 72 inches thick. The loess is as much as 18 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3 unless it is severely eroded. Some pedons have an A horizon, which has value of 3 and chroma of 2 or 3. The Ap horizon is dominantly silt loam but is clay loam or silty clay loam in severely eroded areas. The A horizon is loam or silt loam. The Bt and BC horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. The Bt horizon is dominantly clay or clay loam, but the upper part is silty clay loam in some areas where the loess is at the maximum thickness. The Bt horizon is very strongly acid to slightly acid. The BC horizon is clay loam or loam and is strongly acid to neutral. The C horizon has hue of 10YR, value of 5, and chroma of 3 or 4 and is loam or clay loam. It is mildly alkaline or moderately alkaline.

Carmel Series

The Carmel series consists of deep, well drained, very slowly permeable soils on uplands. The soils formed in a thin mantle of loess and in the underlying clayey material weathered from soft, calcareous shale and limestone. Slopes range from 6 to 12 percent.

Carmel soils are similar to Edenton and Wynn soils and are commonly adjacent to well drained Bonnell, Eden, Edenton, Weisburg, and Wynn soils. The Edenton and Wynn soils are shallower to bedrock than the Carmel soils and formed partly in glacial till on side slopes. The Eden soils are on the steeper side slopes. The Weisburg soils have a fragipan, formed partly in glacial till, and are on the less sloping side slopes and narrow ridgetops above the Carmel soils. The Bonnell soils formed dominantly in glacial till on side slopes.

Typical pedon of Carmel silt loam, 6 to 12 percent slopes, eroded, in a pasture; 380 feet north of the center of sec. 25, T. 8 N., R. 2 W.

Ap—0 to 6 inches; dark yellowish brown (10YR 4/4) silt loam, light yellowish brown (10YR 6/4) dry; weak medium subangular blocky structure; friable; specks of yellowish brown (10YR 5/6) subsoil material;

common very fine roots; medium acid; abrupt smooth boundary

Bt1—6 to 15 inches; yellowish brown (10YR 5/6) silty clay loam; moderate fine subangular blocky structure; firm; few medium roots; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds, very strongly acid; clear smooth boundary

2Bt2—15 to 24 inches, yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure; very firm; very few medium roots, medium continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; clear smooth boundary

2Bt3—24 to 36 inches; yellowish brown (10YR 5/6) silty clay; moderate fine and medium subangular blocky structure; very firm; very few medium roots; medium continuous yellowish brown (10YR 5/6) clay films on faces of peds; common medium dark yellowish brown (10YR 4/4) stains; slickensides 1 to 3 inches wide; medium acid; clear smooth boundary.

2BC—36 to 42 inches, yellowish brown (10YR 5/6) silty clay; weak medium subangular blocky structure; very firm; very few medium roots; thin discontinuous yellowish brown (10YR 5/4) and light yellowish brown (2.5Y 6/4) clay films on faces of peds; 3 percent limestone fragments less than 0.75 inch in size; neutral; clear smooth boundary

2Cr—42 inches, interbedded, soft, calcareous shale and thin-bedded limestone bedrock

The solum is 30 to 50 inches thick. Soft, calcareous shale and limestone bedrock is at a depth of 40 to 60 inches. The loess is 6 to 18 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4 and is silt loam or silty clay loam. The Bt and 2Bt horizons are very strongly acid to slightly acid. The Bt horizon has hue of 10YR, value of 5, and chroma of 4 to 6. The 2Bt and BC horizons have hue of 10YR or 2.5Y, value of 5, and chroma of 4 to 6. They are silty clay or clay. The content of limestone fragments is 0 to 10 percent in the 2BC horizon.

Cincinnati Series

The Cincinnati series consists of deep, well drained soils on uplands. These soils have a fragipan. Permeability is moderate above the fragipan and slow in and below the fragipan. The soils formed in loess and the underlying silty glacial drift and loamy till. Slopes range from 2 to 12 percent.

Cincinnati soils are similar to well drained Weisburg soils and are adjacent to well drained Bonnell soils and moderately well drained Rossmoyne soils. The Weisburg soils are more clayey in the lower part of the subsoil than the Cincinnati soils. The Bonnell soils do not have a fragipan and are on the more sloping side slopes. The Rossmoyne soils have grayish mottles in the upper part of the subsoil and are on the less sloping side slopes.

Typical pedon of Cincinnati silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 620 feet east and 1,400 feet south of the northwest corner of sec. 5, T. 12 N., R. 12 E

Ap—0 to 7 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots, few specks of yellowish brown (10YR 5/4) silt loam; slightly acid; abrupt smooth boundary

Bt1—7 to 12 inches; yellowish brown (10YR 5/4) silty clay loam; weak fine subangular blocky structure; firm; many fine roots; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds slightly acid; clear wavy boundary

Bt2—12 to 24 inches, yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; many fine roots; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; very strongly acid; clear wavy boundary.

Bx1—24 to 29 inches; brown (7.5YR 5/4) silt loam, strong coarse prismatic structure; very firm; brittle; many fine flattened roots on prism walls and caps; thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; continuous medium and thick gray (10YR 6/1) silt films on faces of peds; strongly acid; clear wavy boundary

Bx2—29 to 48 inches; brown (7.5YR 5/4) silt loam, strong very coarse prismatic structure; very firm; brittle; many fine flattened roots along prism faces, thin discontinuous dark brown (7.5YR 4/4) clay films on faces of peds; continuous medium and thick gray (10YR 6/1) silt films on faces of peds; strongly acid; clear wavy boundary

2Bx3—48 to 54 inches; yellowish brown (10YR 5/6) silt loam containing noticeable sand; strong very coarse prismatic structure; very firm; brittle; common medium and fine flattened roots along prism walls, thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; medium continuous gray (10YR 6/1) silt films on prism walls and caps; very strongly acid; gradual wavy boundary

3Bx4—54 to 70 inches; yellowish brown (10YR 5/4) loam; strong very coarse prismatic structure; very firm; brittle; common fine and few medium flattened roots along prism walls, thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; thin patchy light brownish gray (10YR 6/2) silt films on prism walls and on a few prism caps, strongly acid; gradual wavy boundary.

3BC—70 to 80 inches; yellowish brown (10YR 5/4) clay loam; moderate coarse subangular blocky structure; firm; few medium roots along faces of peds; medium acid.

The solum is at least 48 inches thick. The loess is 18 to 40 inches thick. The depth to the fragipan ranges

mainly from 18 to 33 inches but is less than 18 inches in severely eroded areas.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The Bt and Bx horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The Bt horizon is silt loam or silty clay loam. It generally is strongly acid or very strongly acid but ranges to slightly acid in the upper part. The Bx horizon is strongly acid or very strongly acid. The 3Bx horizon is loam or clay loam and is strongly acid or very strongly acid. The 3BC horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. It is loam and clay loam and is medium acid or slightly acid.

Cobbsfork Series

The Cobbsfork series consists of deep, poorly drained, very slowly permeable soils on uplands. The soils formed in loess and the underlying silty glacial drift. Slopes are 0 to 1 percent.

Cobbsfork soils are commonly adjacent to somewhat poorly drained Avonburg soils. The Avonburg soils are yellower below the plow layer than the Cobbsfork soils, are on smaller flats, and have a fragipan.

Typical pedon of Cobbsfork silt loam, in a pasture; 200 feet west and 1,360 feet north of the center of sec. 1, T. 8 N., R. 2 W.

Ap—0 to 13 inches; gray (10YR 5/1) silt loam, light gray (10YR 7/1) dry; many fine prominent dark yellowish brown (10YR 4/4) mottles; moderate fine granular structure; friable; many fine roots; neutral; clear smooth boundary.

E—13 to 21 inches; gray (10YR 6/1) silt loam; common fine distinct pale brown (10YR 6/3) mottles; weak medium platy structure; firm; few fine roots; common fine pores; very strongly acid; clear wavy boundary.

Btgx1—21 to 30 inches; light brownish gray (10YR 6/2) silt loam; many fine distinct brown (10YR 5/3) and grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; brittle in less than 50 percent of the volume; few fine roots; many very fine pores; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous light gray (10YR 6/1) silt films on faces of peds; extremely acid; clear wavy boundary.

Btgx2—30 to 44 inches; light brownish gray (10YR 6/2) silty clay loam; many fine distinct yellowish brown (10YR 5/6) and grayish brown (10YR 5/2) mottles; moderate coarse prismatic structure parting to moderate medium subangular blocky; firm; brittle in less than 50 percent of the volume; few very fine roots; thin discontinuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous light gray (10YR 6/1) silt films on faces of peds; extremely acid; clear wavy boundary.

Btx1—44 to 54 inches; yellowish brown (10YR 5/6) silty clay loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm; brittle in less than 50 percent of the volume; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous light gray (10YR 6/1) silt films on faces of peds; extremely acid; gradual wavy boundary.

2Btx2—54 to 70 inches; yellowish brown (10YR 5/6) silty clay loam; moderate very coarse prismatic structure parting to moderate medium subangular blocky; firm; brittle in less than 50 percent of the volume; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous light gray (10YR 6/1) silt films on faces of peds; very strongly acid; gradual wavy boundary.

2Bt—70 to 80 inches; yellowish brown (10YR 5/6) silty clay loam; weak coarse subangular blocky structure; firm; few fine roots; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; thick continuous light gray (10YR 6/1) silt films on faces of peds; medium acid.

The solum is more than 80 inches thick. The loess is 40 to 65 inches thick. The silty glacial drift extends to a depth of more than 80 inches. A firm, brittle horizon is at a depth of 18 to 40 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 1 or 2. The part of the Btgx horizon within a depth of 40 inches has hue of 10YR, value of 5 or 6, and chroma of 1 or 2. Below a depth of 40 inches, the Btgx, Btx, 2Btx, and 2Bt horizons have hue of 10YR, value of 5 or 6, and chroma of 1 to 6. The Btgx, Btx, and 2Btx horizons are extremely acid to strongly acid, and the 2Bt horizon is very strongly acid to medium acid.

Corydon Series

The Corydon series consists of shallow, well drained, moderately slowly permeable soils on side slopes in the uplands. The soils formed in material weathered from hard limestone bedrock of Silurian age. Slopes range from 18 to 50 percent.

These soils do not have an argillic horizon and contain less clay in the subsoil than is definitive for the Corydon series. These differences, however, do not alter the usefulness or behavior of the soils.

Corydon soils are similar to well drained Eden soils and are commonly adjacent to those soils. The Eden soils are more clayey in the subsoil than the Corydon soils, have a more olive hue, and formed in material weathered from interbedded, calcareous, soft shale and limestone of older age. They are at the lower elevations.

Typical pedon of Corydon silty clay loam, 18 to 50 percent slopes, in an area of woodland; 600 feet east

and 1,200 feet north of the southwest corner of sec. 20, T. 12 N., R. 12 E.

A—0 to 3 inches; very dark grayish brown (10YR 3/2) silty clay loam, brown (10YR 5/3) dry; moderate medium granular structure; friable; 3 percent channers; slight effervescence; mildly alkaline; clear wavy boundary.

Bw1—3 to 7 inches; dark brown (10YR 3/3) silty clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; firm; thin continuous dark grayish brown (10YR 4/2) organic films on faces of peds, 10 percent limestone flagstones; slight effervescence; mildly alkaline; gradual wavy boundary.

Bw2—7 to 14 inches; brown (10YR 4/3) silty clay loam; moderate fine subangular blocky structure; firm; thin discontinuous dark brown (10YR 4/3) organic films on faces of peds; 8 percent limestone flagstones and 5 percent channers; slight effervescence; mildly alkaline; gradual wavy boundary.

BC—14 to 17 inches; brown (10YR 5/3) flaggy loam; weak fine subangular blocky structure; friable; 15 percent limestone channers and flagstones; strong effervescence; mildly alkaline; abrupt irregular boundary.

R—17 inches; hard limestone bedrock.

The solum is 10 to 20 inches thick. It is medium acid to mildly alkaline.

The A horizon has hue of 10YR, value of 3, and chroma of 2 or 3 and is silt loam or silty clay loam. It is as much as 15 percent limestone flagstones and channers. The Bw horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is as much as 15 percent limestone flagstones and channers. The BC horizon has hue of 10YR or 7.5YR, value of 5 or 6, and chroma of 3 or 4 and is flaggy loam, loam, or silt loam. It is 10 to 20 percent limestone flagstones and channers.

Cyclone Series

The Cyclone series consists of deep, poorly drained soils in depressions on uplands. These soils are moderately permeable in the solum and moderately slowly permeable in the substratum. They formed in loess and the underlying loamy glacial till. Slopes range from 0 to 2 percent.

Cyclone soils are similar to Milford soils and are commonly adjacent to somewhat poorly drained Fincastle soils, very poorly drained Milford soils, and somewhat poorly drained Reesville soils. The Milford soils are more clayey than the Cyclone soils, have less sand in the lower part of the solum, and are on the more depressional parts of the landscape. The Fincastle and Reesville soils are lighter colored in the surface layer and in the upper part of the subsoil than the Cyclone soils and are in higher positions on the landscape.

Typical pedon of Cyclone silt loam, in a cultivated field; 1,000 feet north and 500 feet east of the southwest corner of sec. 21, T. 9 N., R. 1 W.

Ap—0 to 10 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; moderate medium granular structure; firm; slightly acid; abrupt smooth boundary.

A—10 to 17 inches; very dark gray (10YR 3/1) silt loam, grayish brown (10YR 5/2) dry; few medium prominent light olive brown (2.5Y 5/4) mottles; moderate medium subangular blocky structure; firm; neutral; clear smooth boundary.

Btg—17 to 27 inches; gray (10YR 5/1) silty clay loam; many medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous gray (10YR 5/1) clay films on faces of peds; neutral; clear smooth boundary.

Bt1—27 to 43 inches; yellowish brown (10YR 5/4) silt loam; many medium prominent grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous gray (10YR 5/1) clay films on faces of peds; neutral; gradual smooth boundary.

Bt2—43 to 52 inches; yellowish brown (10YR 5/4) silt loam; many medium prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin patchy gray (10YR 5/1) clay films on faces of peds; neutral; clear smooth boundary.

2BC—52 to 57 inches; yellowish brown (10YR 5/4) loam; many medium prominent grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy gray (10YR 5/1) clay films on faces of peds; 1 percent gravel; neutral; clear smooth boundary.

2C—57 to 65 inches; yellowish brown (10YR 5/4) loam; many coarse prominent grayish brown (10YR 5/2) mottles; moderate medium platy rock structure; very firm; 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 55 to 70 inches thick. The loess is 40 to 60 inches thick.

The Ap and A horizons have hue of 10YR, value of 2 or 3, and chroma of 1 or 2. They are silt loam or silty clay loam. The Btg horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 1 or 2 and is silt loam or silty clay loam. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 1 to 4 and is silt loam or silty clay loam. The 2BC horizon has colors similar to those of the Bt horizon and is loam or clay loam containing 1 to 5 percent gravel. The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 4 and is mildly alkaline or moderately alkaline. The gravel content in this horizon ranges from 1 to 5 percent.

Dearborn Series

The Dearborn series consists of deep, well drained, moderately permeable soils on flood plains. The soils formed in channery and flaggy, loamy alluvium. Slopes range from 0 to 2 percent.

Dearborn soils are similar to Moundhaven soils and are commonly adjacent to Eden soils. The Moundhaven and Eden soils have a lighter colored surface layer than the Dearborn soils. Also, the Moundhaven soils contain more sand and have no coarse fragments in the control section. The Eden soils are on strongly sloping to very steep side slopes in the uplands.

Typical pedon of Dearborn loam, frequently flooded, in a pasture; 2,000 feet north and 400 feet east of the southwest corner of sec. 21, T. 8 N., R. 1 W.

A—0 to 10 inches; dark brown (10YR 3/3) loam, brown (10YR 5/3) dry; weak medium granular structure; friable; 5 percent channers; strong effervescence; moderately alkaline; gradual wavy boundary.

Bw—10 to 15 inches; dark brown (10YR 4/3) channery loam; weak fine subangular blocky structure; friable; common thin dark brown (10YR 3/3) organic films on faces of peds and coarse fragments; 20 percent channers and flagstones; strong effervescence; moderately alkaline; gradual wavy boundary.

C1—15 to 48 inches; brown (10YR 5/3) extremely channery loam; massive; friable; 70 percent limestone channers and flagstones; violent effervescence; moderately alkaline; diffuse irregular boundary.

C2—48 to 60 inches; brown (10YR 5/3) extremely flaggy loam; massive; friable; 60 percent limestone flagstones and channers; violent effervescence; moderately alkaline.

The solum is 10 to 20 inches thick. It is mildly alkaline or moderately alkaline.

The Ap or A horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The Bw horizon has hue of 10YR, value of 4, and chroma of 3 or 4. It is the flaggy or channery analogs of loam or silt loam. The C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is the very channery, very flaggy, extremely channery, or extremely flaggy analogs of loam or silt loam.

Eden Series

The Eden series consists of moderately deep, well drained, slowly permeable soils on uplands. The soils formed in clayey material weathered from interbedded, soft, calcareous shale and thin-bedded limestone bedrock. Slopes range from 15 to 60 percent.

Because of a low clay content, these soils do not have an argillic horizon, which is definitive for the Eden series. This difference, however, does not affect the use and management of the soils.

Eden soils are similar to Corydon soils and are commonly adjacent to well drained Carmel, Dearborn, Uniontown, and Woolper soils. The Corydon soils are less clayey than the Eden soils and formed in material weathered from hard limestone. They are on the higher parts of the landscape. The Carmel soils have a thicker solum than the Eden soils, are deeper to bedrock, and generally are less sloping. The Dearborn soils are less clayey than the Eden soils and are in nearly level drainageways. The Uniontown soils formed in lacustrine sediments and are at the base of the slopes. The Woolper soils are deeper to bedrock than the Eden soils and are on less sloping, lower side slopes.

Typical pedon of Eden very flaggy silty clay, 25 to 60 percent slopes, stony, in an area of woodland; 600 feet north and 400 feet west of the southeast corner of sec. 29, T. 8 N., R. 1 W.

A—0 to 2 inches; very dark grayish brown (10YR 3/2) very flaggy silty clay, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; 20 percent flagstones, 15 percent channers, and 5 percent stones; neutral; clear smooth boundary.

BA—2 to 4 inches; brown (10YR 4/3) very flaggy silty clay; weak fine subangular blocky structure; firm; 25 percent channers and 20 percent flagstones; neutral; clear wavy boundary.

Bt1—4 to 13 inches; brown (10YR 4/3) very flaggy clay; strong medium angular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds and flagstones; 25 percent limestone flagstones, 5 percent stones, and 10 percent channers; neutral; clear wavy boundary.

Bt2—13 to 23 inches; light olive brown (2.5Y 5/4) flaggy silty clay; moderate medium angular blocky structure; firm; thin discontinuous very dark grayish brown (10YR 3/2) clay films on faces of peds; 20 percent limestone flagstones, 5 percent stones, and 5 percent channers; slight effervescence; mildly alkaline; clear smooth boundary.

Cr—23 inches; interbedded, soft, calcareous shale and thin-bedded limestone bedrock.

The solum is 14 to 30 inches thick. It is neutral to moderately alkaline. The depth to paralithic bedrock is 20 to 40 inches.

The A horizon has hue of 10YR or 2.5Y, value of 3 to 5, and chroma of 2 to 4. It is the very flaggy to channery analogs of silty clay loam or silty clay. The Bt horizon has hue of 2.5Y, 5Y, or 10YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay, clay, or the flaggy or very flaggy analogs of those textures.

Edenton Series

The Edenton series consists of moderately deep, well drained, slowly permeable soils on uplands. The soils

formed in a thin layer of loess, in loamy glacial till, and in the underlying clayey material weathered from interbedded, soft, calcareous shale and thin-bedded limestone bedrock. Slopes range from 12 to 18 percent.

These soils are less clayey in the upper part of the subsoil than is definitive for the Edenton series. This difference, however, does not affect the use or management of the soils.

Edenton soils are similar to Bonnell, Carmel, and Wynn soils and are commonly adjacent to Bonnell and Carmel soils. The Bonnell soils have a thicker solum than the Edenton soils and formed dominantly in glacial till. The Carmel soils also have a thicker solum and do not have glacial till in the solum. The Wynn soils have a thicker loess mantle than the Edenton soils. Also, they have glacial till with a greater percentage of illitic clay.

Typical pedon of Edenton silt loam, 12 to 18 percent slopes, eroded, in a pasture; 1,470 feet east and 220 feet south of the northwest corner of sec. 16, T. 10 N., R. 12 E.

Ap—0 to 5 inches, dark yellowish brown (10YR 4/4) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary.

Bt1—5 to 14 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds, strongly acid; clear wavy boundary.

Bt2—14 to 27 inches; dark yellowish brown (10YR 4/4) clay loam, moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; strongly acid; clear wavy boundary.

2BC—27 to 34 inches; light olive brown (2.5Y 5/4) channery clay; moderate medium angular and subangular blocky structure; very firm; thin patchy olive brown (2.5Y 4/4) clay films on faces of peds, 15 percent channers and 5 percent flagstones; slight effervescence; neutral, gradual wavy boundary.

2Cr—34 inches, interbedded, soft, calcareous shale and thin-bedded limestone bedrock.

The solum is 20 to 40 inches thick, and the depth to paralithic bedrock is 30 to 40 inches. The loess is as much as 10 inches thick. The depth to the part of the solum that weathered from soft, calcareous shale and limestone bedrock is 20 to 36 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is clay loam or clay and is strongly acid or medium acid. The 2BC horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 4. It is silty clay, clay, or the channery analogs of those textures and is neutral or mildly alkaline.

Eldean Series

The Eldean series consists of deep, well drained soils that are moderately deep to sand and gravel. These soils are on river terraces. Permeability is moderate in the subsoil and rapid or very rapid in the substratum. The soils formed in loamy outwash and sandy and gravelly outwash. Slopes range from 0 to 6 percent.

Eldean soils are commonly adjacent to well drained Fox, Ockley, and Rodman soils. The Fox soils are less clayey in the subsoil than the Eldean soils and are on steeper side slopes. The Ockley soils are less clayey in the subsoil and have a thicker solum. The Rodman soils are steeper than the Eldean soils. Also, they have a thinner solum and a darker surface layer.

Typical pedon of Eldean loam, 0 to 2 percent slopes, in a cultivated field; 1,750 feet east and 150 feet north of the southwest corner of sec. 29, T. 9 N., R. 2 W.

Ap—0 to 8 inches; brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable, neutral; abrupt smooth boundary.

Bt1—8 to 16 inches, dark brown (7.5YR 4/4) clay loam; moderate fine subangular blocky structure; firm; thin patchy strong brown (7.5YR 5/6) clay films on faces of peds and pebbles; 5 percent gravel; neutral, clear smooth boundary.

Bt2—16 to 25 inches; dark brown (7.5YR 3/4) gravelly clay; moderate fine and medium subangular blocky structure; firm; thin continuous strong brown (7.5YR 5/6) clay films on faces of peds; 20 percent gravel, neutral; clear wavy boundary.

Bt3—25 to 30 inches; dark brown (7.5YR 3/2) gravelly sandy clay loam; moderate fine and medium subangular blocky structure; friable; thin discontinuous dark brown (7.5YR 3/2) clay films on faces of peds and pebbles; 20 percent gravel; neutral; abrupt irregular boundary.

C1—30 to 36 inches; pale brown (10YR 6/3) gravelly coarse sandy loam; single grain; loose; 18 percent gravel; strong effervescence; moderately alkaline; abrupt wavy boundary.

C2—36 to 60 inches, pale brown (10YR 6/3) very gravelly coarse sand; single grain, loose; strong effervescence; 35 percent gravel, moderately alkaline.

The solum is 24 to 40 inches thick. The gravel content is as much as 10 percent in the A horizon and the upper part of the Bt horizon, 10 to 25 percent in the lower part of the Bt horizon, and up to 40 percent in the C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. It is loam or silt loam. The upper part of the B horizon has hue of 7.5YR or 10YR and value and chroma of 3 or 4. It is clay, clay loam, sandy clay loam, or the gravelly analogs of those textures. It is medium acid or neutral. The lower part of the Bt horizon

has hue of 7.5YR, value of 3, and chroma of 2 or 3. It is clay loam, loam, sandy clay loam, clay, or the gravelly analogs of those textures. The C horizon is fine to coarse sand, coarse sandy loam, or the gravelly or very gravelly analogs of those textures.

Fincastle Series

The Fincastle series consists of deep, somewhat poorly drained soils on uplands. Permeability is moderate in the solum and moderately slow in the substratum. The soils formed in loess and the underlying loamy glacial till. Slopes range from 0 to 3 percent.

Fincastle soils are similar to Reesville soils and are commonly adjacent to poorly drained Cyclone soils, somewhat poorly drained Reesville soils, and moderately well drained Xenia soils. The Reesville soils have a thicker loess mantle than the Fincastle soils and formed entirely in loess. The Cyclone soils have a thicker, darker surface layer and a grayer subsoil than the Fincastle soils and are in depressions. The Xenia soils do not have a gray matrix color in the subsurface layer or the upper part of the subsoil and are on the more sloping or higher parts of the landscape.

Typical pedon of Fincastle silt loam, 1 to 3 percent slopes, in a cultivated field; 150 feet west and 1,580 feet south of the center of sec. 12, T. 9 N., R. 2 W

Ap—0 to 9 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak fine granular structure; friable; medium acid; abrupt smooth boundary

E—9 to 13 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; weak medium platy structure; friable; medium acid; clear smooth boundary

Bt1—13 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium prismatic structure parting to moderate medium subangular blocky; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; clear smooth boundary

Bt2—21 to 32 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct grayish brown (10YR 5/2) mottles; weak medium prismatic structure parting to moderate coarse subangular blocky; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; neutral; clear smooth boundary

2Bt3—32 to 35 inches; yellowish brown (10YR 5/4) loam; common medium distinct light brownish gray (10YR 6/2) mottles; weak medium subangular blocky structure; firm; thin continuous grayish brown (10YR 5/2) clay films on faces of peds; 3 percent gravel; neutral; clear wavy boundary

2BC—35 to 51 inches; yellowish brown (10YR 5/6) loam; common medium distinct yellowish brown (10YR 5/8) and many medium distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) clay films on faces of peds; 2 percent gravel; mildly alkaline; clear smooth boundary

2C—51 to 60 inches; yellowish brown (10YR 5/4) loam; few fine prominent light brownish gray (10YR 6/2) mottles; moderate medium platy rock structure; very firm; 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 40 to 55 inches thick. The loess is 22 to 40 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3. The E horizon has hue of 10YR, value of 5 or 6, and chroma of 2. The Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6. It is silt loam or silty clay loam and is dominantly neutral or slightly acid. The 2Bt horizon has hue of 10YR, value of 5 or 6, and chroma of 2 to 6 and is loam or clay loam. The 2BC horizon has hue of 10YR, value of 4 to 6, and chroma of 2 to 6 and is neutral or mildly alkaline. The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. The content of gravel in this horizon is 1 to 5 percent.

Fox Series

The Fox series consists of deep, well drained soils that are moderately deep to sand and gravel. These soils are on river terraces. Permeability is moderate in the subsoil and rapid in the substratum. The soils formed in loamy outwash over sandy and gravelly outwash. Slopes range from 6 to 15 percent.

Fox soils are similar to Ockley soils and are commonly adjacent to Eldean, Ockley, and Rodman soils. The Ockley and Eldean soils are less sloping than the Fox soils. Also, the Ockley soils have a thicker solum, and the Eldean soils have a thicker, more clayey subsoil. The Rodman soils have a darker surface layer, have a thinner solum, and are steeper than the Fox soils, and they do not have a clayey subsoil.

Typical pedon of Fox gravelly sandy clay loam, in a cultivated area of Fox complex, 6 to 15 percent slopes, severely eroded; 2,530 feet east and 1,100 feet north of the southwest corner of sec. 3, T. 8 N., R. 2 W

Ap—0 to 6 inches; dark brown (10YR 4/3) gravelly sandy clay loam, brown (10YR 5/3) dry; moderate fine subangular blocky structure; firm; 18 percent gravel; neutral; abrupt smooth boundary.

Bt1—6 to 14 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 3/2) clay films on faces of peds and coating pebbles; 18 percent gravel; neutral; clear wavy boundary

Bt2—14 to 17 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7 5YR 3/2) clay films on faces of peds and coating pebbles; 20 percent gravel; slightly acid; clear wavy boundary

Bt3—17 to 21 inches; dark brown (7.5YR 4/4) gravelly sandy clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark brown (7 5YR 3/2) clay films on faces of peds and coating pebbles; 20 percent gravel; neutral; clear wavy boundary

Bt4—21 to 25 inches; dark brown (7.5YR 4/4) gravelly sandy loam; moderate medium subangular blocky structure; firm; thin discontinuous dark brown (7 5YR 3/2) clay films on faces of peds and coating pebbles; 20 percent gravel; neutral; abrupt irregular boundary

C1—25 to 29 inches; light yellowish brown (10YR 6/4) gravelly loamy coarse sand; single grain; loose; 25 percent gravel; strong effervescence; moderately alkaline; abrupt wavy boundary.

C2—29 to 60 inches; pale brown (10YR 6/3) gravelly coarse sand; single grain; loose; 25 percent gravel; strong effervescence; moderately alkaline.

The solum is 24 to 29 inches thick. The content of gravel is 10 to 25 percent in the solum and is up to 35 percent in the C horizon.

The A horizon has hue of 10YR, value of 4 or 5, and chroma of 3. It is gravelly sandy loam to sandy clay loam. The Bt1 and Bt2 horizons have hue of 7.5YR or 10YR and value and chroma of 4. They are loam, clay loam, sandy clay loam, or the gravelly analogs of those textures. They are medium acid to neutral. The Bt3 and Bt4 horizons have hue of 7 5YR, value of 3 or 4, and chroma of 3 or 4. They are clay loam, loam, sandy clay loam, sandy loam, or the gravelly analogs of those textures. They are neutral or mildly alkaline. The C horizon is loamy coarse sand, sand, coarse sand, or the gravelly or very gravelly analogs of those textures.

Gessie Series

The Gessie series consists of deep, well drained soils on flood plains. Permeability is moderate in the upper part of the profile and rapid in the lower part. The soils formed in recent loamy and sandy alluvium. Slopes range from 0 to 2 percent.

The occasionally flooded Gessie soils in this county contain less sand in the control section than is definitive for the series. This difference, however, does not alter the usefulness or behavior of the soils.

Gessie soils are similar to Wirt soils and commonly are adjacent to well drained Ross soils and somewhat excessively drained Moundhaven soils. The Wirt soils are less clayey than the Gessie soils and are not calcareous in the upper 40 inches. The Ross soils have a darker surface layer and are slightly higher on the flood plains than the Gessie soils. The Moundhaven soils are more sandy than the Gessie soils, have a lower available water capacity, and generally are closer to the streams.

Typical pedon of Gessie loam, sandy substratum, occasionally flooded, in a cultivated field; 1,050 feet south and 980 feet west of the northeast corner of sec. 35, T. 12 N., R. 12 E.

Ap—0 to 10 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; slight effervescence; mildly alkaline; abrupt smooth boundary.

C1—10 to 30 inches; dark yellowish brown (10YR 4/4) silt loam, brown (10YR 4/3) crushed; moderate fine subangular blocky structure; friable; thin continuous dark grayish brown (10YR 4/2) organic films on faces of peds; strong effervescence; mildly alkaline; gradual wavy boundary

C2—30 to 37 inches; dark yellowish brown (10YR 4/4) silt loam, brown (10YR 4/3) crushed; moderate fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) organic films on faces of peds; strong effervescence; mildly alkaline; clear wavy boundary

C3—37 to 44 inches; dark yellowish brown (10YR 4/4) loam, brown (10YR 4/3) crushed; moderate fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) organic films on faces of peds; strong effervescence; mildly alkaline; clear wavy boundary

C4—44 to 54 inches; yellowish brown (10YR 5/4) loamy coarse sand; massive; friable; strong effervescence; mildly alkaline; abrupt wavy boundary

C5—54 to 60 inches; yellowish brown (10YR 5/4) loamy coarse sand; single grain; loose; 10 percent gravel; strong effervescence; mildly alkaline.

The soils are mildly alkaline or moderately alkaline and have free carbonates throughout. The Ap horizon has hue of 10YR, value of 3 or 4, and chroma of 3 and is loam or silt loam. The C1, C2, and C3 horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4 and are loam or silt loam. The C4 and C5 horizons have hue of 10YR, value of 4 to 6, and chroma of 3 to 6. They are mainly loamy coarse sand or sand, but thin strata of sandy loam, loam, or silt loam are in some pedons.

Hennepin Series

The Hennepin series consists of deep, well drained soils on uplands. The soils are moderately permeable in the subsoil and moderately slowly permeable in the substratum. They formed in loamy glacial till. Slopes range from 25 to 60 percent.

Hennepin soils are adjacent to well drained Miami soils. The Miami soils have an argillic horizon, have a

thicker solum than the Hennepin soils, and are on less sloping ridgetops and side slopes.

Typical pedon of Hennepin loam, 25 to 60 percent slopes, in an area of brushy woods; 400 feet west and 1,200 feet south of the center of sec. 28, T. 9 N., R. 2 W.

A—0 to 7 inches; dark brown (10YR 3/3) loam, dark yellowish brown (10YR 4/4) crushed and smoothed, pale brown (10YR 6/3) dry; moderate fine subangular blocky structure; friable; many fine and medium roots; 2 percent gravel; strong effervescence; mildly alkaline; clear wavy boundary.

Bw—7 to 15 inches; yellowish brown (10YR 5/4) loam; weak medium subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) organic films on faces of peds; many fine and medium roots; 2 percent gravel; strong effervescence; mildly alkaline; clear smooth boundary

C—15 to 60 inches, yellowish brown (10YR 5/4) loam; many medium faint yellowish brown (10YR 5/6) mottles; moderate medium platy rock structure; very firm; few medium roots; 2 percent fine gravel and 2 percent cobbles; few light brownish gray (10YR 6/2) lime streaks; strong effervescence; moderately alkaline.

The solum is 10 to 20 inches thick. The A horizon has hue of 10YR, value of 3 or 4, and chroma of 2 or 3. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4 and is slightly acid to moderately alkaline. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Holton Series

The Holton series consists of deep, somewhat poorly drained, moderately permeable soils on flood plains. The soils formed in recent loamy alluvium. Slopes range from 0 to 2 percent.

Holton soils are commonly adjacent to moderately well drained Oldenburg soils. The Oldenburg soils are not grayish, do not have grayish mottles directly below the surface layer, and are higher on the flood plains than the Holton soils.

Typical pedon of Holton silt loam, occasionally flooded, in a cultivated field; 110 feet west and 2,550 feet south of the northeast corner of sec. 27, T. 10 N., R. 11 E.

Ap—0 to 11 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary

Bw1—11 to 15 inches; grayish brown (10YR 5/2) silt loam; many fine distinct dark yellowish brown (10YR 4/4) mottles; weak fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) organic films on faces of peds; neutral; clear smooth boundary

Bw2—15 to 21 inches; brown (10YR 5/3) silt loam; many fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) organic films on faces of peds; neutral; clear smooth boundary

Bw3—21 to 32 inches; grayish brown (10YR 5/2) loam, common fine distinct dark yellowish brown (10YR 4/4) and common fine faint light brownish gray (10YR 6/2) mottles; weak fine subangular blocky structure; friable; thin discontinuous dark grayish brown (10YR 4/2) organic films on faces of peds, neutral; clear smooth boundary

Bw4—32 to 38 inches; light brownish gray (10YR 6/2) sandy loam; common fine prominent dark brown (7.5YR 4/4) mottles; very weak fine subangular blocky structure; very friable; neutral; clear smooth boundary

C1—38 to 46 inches; gray (10YR 6/1) sandy loam; common fine distinct dark yellowish brown (10YR 4/4) mottles; massive; very friable; neutral; clear smooth boundary

C2—46 to 54 inches; dark gray (10YR 4/1) loam; common fine dark yellowish brown (10YR 4/4) mottles, massive; friable; neutral; clear smooth boundary.

C3—54 to 60 inches; dark gray (10YR 4/1) sandy loam; common fine dark yellowish brown (10YR 4/4) mottles; massive; friable, neutral.

The solum is 30 to 40 inches thick and is neutral to medium acid. The A horizon has hue of 10YR, value of 4 or 5, and chroma of 2 or 3 and is silt loam or loam. The Bw and C horizons have hue of 10YR, value of 4 to 6, and chroma of 1 to 6. The Bw horizon mainly is loam or silt loam but has strata of fine sandy loam or sandy loam. The C horizon is loam, fine sandy loam, or sandy loam.

Miami Series

The Miami series consists of deep, well drained soils on uplands. The soils are moderately permeable in the subsoil and moderately slowly permeable in the substratum. They formed in a thin mantle of loess and in the underlying loamy glacial till. Slopes range from 2 to 18 percent.

Miami soils are adjacent to well drained Hennepin, Russell, and Wynn soils and moderately well drained Williamstown and Xenia soils. The Hennepin soils are steeper than the Miami soils, have a thinner solum, and do not have an argillic horizon. The Russell soils have a loess mantle that is 20 to 40 inches thick. The Wynn soils are more clayey in the lower part of the solum than

the Miami soils and formed partly in clayey material weathered from soft, calcareous shale and limestone. The Williamstown and Xenia soils have grayish mottles in the lower part of the solum and are on ridgetops and the upper side slopes.

Typical pedon of Miami silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 1,800 feet west and 400 feet south of the northeast corner of sec. 21, T. 8 N., R. 1 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak fine granular structure; friable; few specks of yellowish brown (10YR 5/4) subsoil material; slightly acid; clear smooth boundary.

Bt—8 to 28 inches; yellowish brown (10YR 5/4) clay loam; moderate medium and coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; 3 percent gravel; slightly acid; clear smooth boundary.

BC—28 to 34 inches; brown (10YR 5/3) loam; moderate coarse subangular blocky structure; firm; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds and in pores; 3 percent gravel; slight effervescence; moderately alkaline; clear wavy boundary.

C—34 to 60 inches; pale brown (10YR 6/3) loam; moderate medium platy rock structure; very firm; 3 percent gravel; strong effervescence; moderately alkaline.

The solum is 24 to 40 inches thick. The loess is as much as 18 inches thick.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. It is silt loam, loam, or clay loam. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It mainly is loam or clay loam but ranges to silt loam or silty clay loam where the loess is thick. It is medium acid or slightly acid. The BC and C horizons have hue of 10YR, value of 5 or 6, and chroma of 3 or 4. They are mildly alkaline or moderately alkaline. The BC horizon is loam or clay loam.

Milford Series

The Milford series consists of deep, very poorly drained, moderately slowly permeable soils in potholes on uplands and river terraces. The soils formed in silty and clayey sediments. Slopes are 0 to 1 percent.

Milford soils are commonly adjacent to poorly drained Cyclone soils. The Cyclone soils formed in loess and glacial till, are less clayey than the Milford soils, and are on higher parts of the landscape.

Typical pedon of Milford silty clay loam, in a cultivated field; 150 feet north and 1,400 feet east of the southwest corner of sec. 21, T. 10 N., R. 1 W.

Ap—0 to 9 inches; very dark gray (10YR 3/1) silty clay loam, dark gray (10YR 4/1) dry; strong medium granular structure; firm; neutral; abrupt smooth boundary.

A—9 to 14 inches; very dark gray (10YR 3/1) silty clay, dark gray (10YR 4/1) dry; moderate coarse angular blocky structure; firm; thin discontinuous very dark gray (10YR 3/1) organic films on faces of peds; neutral; clear wavy boundary.

Bg1—14 to 18 inches; dark gray (10YR 4/1) silty clay; common medium distinct very dark gray (N 3/0) mottles; moderate medium prismatic structure parting to strong medium angular blocky; thin discontinuous gray (10YR 5/1) organic films on faces of peds; firm; neutral; clear wavy boundary.

Bg2—18 to 31 inches; light brownish gray (2.5Y 6/2) silty clay; many medium prominent yellowish brown (10YR 5/6) mottles; weak medium prismatic structure parting to moderate medium angular blocky; firm; thin discontinuous gray (10YR 5/1) organic films on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

BCg1—31 to 39 inches; light brownish gray (2.5Y 6/2) silt loam; weak medium subangular blocky structure; firm; strong effervescence; mildly alkaline; clear irregular boundary.

BCg2—39 to 46 inches; gray (10YR 6/1) silt loam; many medium prominent yellowish brown (10YR 5/6) and strong brown (7.5YR 5/6) mottles; weak medium and coarse subangular blocky structure; firm; strong effervescence; mildly alkaline; clear wavy boundary.

Cg1—46 to 54 inches; gray (10YR 5/1) silt loam; many medium distinct dark yellowish brown (10YR 4/4) and dark gray (10YR 4/1) mottles; massive; firm; strong effervescence; moderately alkaline; clear wavy boundary.

Cg2—54 to 60 inches; dark gray (N 4/0) silt loam; many medium prominent strong brown (7.5YR 4/6) mottles; massive; firm; strong effervescence; moderately alkaline.

The solum is 38 to 50 inches thick. The mollic epipedon is 12 to 22 inches thick.

The A horizon has hue of 10YR, value of 2 or 3, and chroma of 1, or it is neutral in hue and has value of 2 or 3. The A and Bg horizons are silty clay loam or silty clay. The Bg and BCg horizons have hue of 10YR, 2.5Y, or 5Y, value of 4 to 6, and chroma of 1 or 2 or are neutral in hue. The Bg horizon is neutral or mildly alkaline. The BCg horizon is neutral to moderately alkaline. The BCg and C horizons are silt loam to silty clay. The C horizon has hue of 2.5Y or 10YR, value of 4 to 6, and chroma of 1 to 6 or is neutral in hue. It is mildly alkaline or moderately alkaline.

Moundhaven Series

The Moundhaven series consists of deep, somewhat excessively drained, rapidly permeable soils on flood plains. These soils formed in recent sandy alluvium. Slopes range from 0 to 2 percent.

Moundhaven soils are similar to Dearborn soils and are commonly adjacent to well drained Gessie soils. The Dearborn soils have a darker surface layer than the Moundhaven soils, contain less sand, and have coarse fragments. The Gessie soils have more clay in the substratum than the Moundhaven soils, are less droughty, and are generally farther from the streams.

Typical pedon of Moundhaven sandy loam, occasionally flooded, in a cultivated field; 510 feet north and 2,200 feet west of the southeast corner of sec. 19, T. 8 N., R. 1 W.

Ap—0 to 14 inches, brown (10YR 4/3) sandy loam, pale brown (10YR 6/3) dry; weak medium granular structure; very friable; many fine roots, strong effervescence; mildly alkaline; abrupt wavy boundary.

C1—14 to 19 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium granular structure; very friable; many fine roots; strong effervescence; moderately alkaline; abrupt wavy boundary

C2—19 to 26 inches; stratified yellowish brown (10YR 5/4) sand and brown (10YR 4/3) sandy loam; 80 percent is sand strata; weak medium granular structure in sandy loam and single grain in sand; friable sandy loam and loose sand; many fine roots, strong effervescence; moderately alkaline; abrupt wavy boundary

C3—26 to 32 inches; yellowish brown (10YR 5/4) sand; single grain; loose, common fine roots, strong effervescence; moderately alkaline; abrupt wavy boundary.

C4—32 to 35 inches; dark brown (10YR 3/3) silt loam; weak medium granular structure; friable; few fine roots; strong effervescence; moderately alkaline; abrupt wavy boundary

C5—35 to 38 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium granular structure; friable; strong effervescence; moderately alkaline; clear smooth boundary.

C6—38 to 60 inches; light yellowish brown (10YR 6/4) sand; single grain; loose; strong effervescence; moderately alkaline.

The content of fine gravel is up to 5 percent between depths of 10 to 40 inches. The Ap horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. The C horizon has hue of 10YR, value of 3 to 5, and chroma of 3 or 4. It mainly is loamy sand or sand, but it has thin strata of sandy loam or silt loam.

Ockley Series

The Ockley series consists of deep, well drained soils on river terraces. Permeability is moderate in the subsoil and very rapid in the substratum. The soils formed in loamy outwash over sandy and gravelly outwash. Slopes range from 0 to 6 percent.

Ockley soils are similar to Fox soils and are commonly adjacent to well drained Eldean and Fox soils. The Fox soils have a thinner solum than the Ockley soils and are more sloping. The Eldean soils have a thinner, more clayey subsoil than the Ockley soils.

Typical pedon of Ockley loam, 0 to 2 percent slopes, in a cultivated field; 420 feet west and 380 feet south of the northeast corner of sec. 28, T. 12 N., R. 12 E.

Ap—0 to 12 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary

Bt1—12 to 15 inches; yellowish brown (10YR 5/4) clay loam; moderate fine subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 3/4) clay films on faces of peds, slightly acid; clear wavy boundary.

Bt2—15 to 29 inches; dark yellowish brown (10YR 4/4) clay loam; moderate medium subangular blocky structure, firm, thin continuous dark ye lowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary

Bt3—29 to 36 inches; dark yellowish brown (10YR 4/4) clay loam; moderate coarse subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds and on pebbles; 6 percent gravel, slightly acid; clear wavy boundary

Bt4—36 to 42 inches; dark yellowish brown (10YR 4/4) gravelly clay loam; moderate coarse subangular blocky structure; firm, thin continuous dark ye lowish brown (10YR 4/4) clay films on faces of peds 15 percent gravel; neutral; clear wavy boundary

Bt5—42 to 46 inches, dark brown (7 5YR 3/2) gravelly clay loam; weak coarse subangular blocky structure; firm, thin discontinuous dark brown (7 5YR 3/2) clay films on faces of peds, 17 percent gravel neutral, abrupt irregular boundary

2C1—46 to 54 inches; yellowish brown (10YR 5/4) gravelly loamy coarse sand; massive; friable; 20 percent gravel; strong effervescence; moderately alkaline; clear wavy boundary.

2C2—54 to 60 inches; brown (10YR 5/3) gravelly coarse sand; lenses of coarse sand; single grain; loose; 25 percent gravel; strong effervescence; moderately alkaline

The solum is 40 to 60 inches thick. The loess or silty material is 0 to 15 inches thick. The content of gravel

ranges from 0 to 10 percent in the upper part of the Bt horizon and from 15 to 45 percent in the lower part.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4 and is loam or silt loam. The Bt1 and Bt2 horizons have hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 3 to 6. They are dominantly clay loam or sandy clay loam, but the range includes silty clay loam and silt loam. These horizons are medium acid or slightly acid. The Bt3 and Bt4 horizons are similar in color to the upper part of the Bt horizon. They are clay loam, gravelly clay loam, or gravelly sandy clay loam and are medium acid to neutral. The Bt5 horizon has hue of 7.5YR, value of 3 or 4, and chroma of 2 or 3. The 2C horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is stratified coarse sand, loamy coarse sand, or the gravelly or very gravelly analogs of those textures.

Oldenburg Series

The Oldenburg series consists of deep, moderately well drained, moderately permeable soils on flood plains. The soils formed in recent loamy alluvium. Slopes range from 0 to 2 percent.

Oldenburg soils are commonly adjacent to somewhat poorly drained Holton soils and well drained Wirt soils. The Holton soils are dominantly grayish in the upper part of the subsoil and generally are lower on the flood plains than the Oldenburg soils. The Wirt soils do not have grayish mottles and generally are higher on the landscape than the Oldenburg soils.

Typical pedon of Oldenburg silt loam, occasionally flooded, in a cultivated field; 800 feet west and 1,800 feet south of the northeast corner of sec. 13, T. 10 N., R. 11 E.

Ap—0 to 9 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; many fine roots; neutral; abrupt smooth boundary.

Bw1—9 to 17 inches; dark brown (10YR 4/3) silt loam; weak fine subangular blocky structure; friable; many fine roots; thin continuous dark brown (10YR 3/3) organic films on faces of peds; neutral; clear wavy boundary.

Bw2—17 to 25 inches, dark brown (10YR 4/3) loam; common fine distinct grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable, common fine roots, thin continuous dark brown (10YR 4/3) organic films on faces of peds, neutral; clear wavy boundary.

Bw3—25 to 39 inches, brown (10YR 5/3) loam; common fine faint grayish brown (10YR 5/2) mottles; weak fine subangular blocky structure; friable; common fine roots; thin discontinuous dark brown (10YR 4/3) organic films on faces of peds; neutral; gradual wavy boundary.

C1—39 to 46 inches; brown (10YR 5/3) loam; few fine faint light brownish gray (10YR 6/2) and few fine faint grayish brown (10YR 5/2) mottles; massive friable; few fine roots; neutral, clear wavy boundary.

C2—46 to 53 inches; brown (10YR 5/3) sandy loam; common fine faint grayish brown (10YR 5/2) mottles; massive; friable; neutral; clear wavy boundary.

C3—53 to 60 inches, brown (10YR 5/3) loam; common fine faint grayish brown (10YR 5/2) mottles, massive; friable; neutral.

The solum is 20 to 40 inches thick. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Bw and C horizons are neutral to medium acid. The Bw horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It is silt loam or loam. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 1 to 4.

Princeton Series

The Princeton series consists of deep, well drained, moderately permeable soils on uplands. The soils formed in loamy and sandy windblown material. Slopes range from 4 to 12 percent.

Princeton soils are similar to Alvin soils and are commonly adjacent to well drained Miami soils. The Alvin soils are less clayey than the Princeton soils and formed in stratified water-laid sediments. The Miami soils formed in glacial till in the lower landscape positions.

Typical pedon of Princeton fine sandy loam, 4 to 12 percent slopes, in a pasture; 1,320 feet west and 320 feet north of the southeast corner of sec. 22, T. 12 N., R. 12 E.

Ap—0 to 5 inches, brown (10YR 4/3) fine sandy loam, pale brown (10YR 6/3) dry; weak medium subangular blocky structure; friable; many very fine roots; medium acid; abrupt smooth boundary.

BA—5 to 13 inches, dark yellowish brown (10YR 4/4) fine sandy loam; weak fine subangular blocky structure; friable; common very fine roots; medium acid; clear smooth boundary.

Bt1—13 to 21 inches; brown (7.5YR 4/4) sandy loam; moderate medium subangular blocky structure; friable; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds, few very fine roots; medium acid; clear smooth boundary.

Bt2—21 to 34 inches, brown (7.5YR 4/4) sandy clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary.

Bt3—34 to 45 inches; strong brown (7.5YR 5/6) sandy loam; moderate medium subangular blocky structure; friable, thin continuous dark brown (7.5YR 4/2) clay films on faces of peds; slightly acid, clear smooth boundary.

Bt4—45 to 54 inches; dark yellowish brown (10YR 4/4) loamy sand; weak medium subangular blocky structure; friable; brown (7.5YR 4/4) clay bridges between sand grains; slightly acid; clear smooth boundary

Bt5—54 to 62 inches; strong brown (7.5YR 5/6) sandy loam; moderate medium subangular blocky structure; friable; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; slightly acid; clear smooth boundary

BC—62 to 66 inches; dark yellowish brown (10YR 4/4) sandy loam; weak medium subangular blocky structure; friable; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; 5 percent gravel; neutral; abrupt smooth boundary.

C—66 to 70 inches; yellowish brown (10YR 5/6) sand; single grain; loose; neutral.

The solum is 45 to 72 inches thick. The Ap horizon has hue of 10YR, value of 4, and chroma of 3 or 4 and is fine sandy loam, sandy loam, or loam. The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5, and chroma of 4 to 6. It is sandy clay loam, fine sandy loam, sandy loam, or loam and has subhorizons of loamy sand below a depth of 40 inches. It is strongly acid to slightly acid. The BC horizon is sandy loam or loamy sand and is strongly acid to neutral. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6 and has strata of sandy loam and silt loam in places. It is neutral to moderately alkaline.

Reesville Series

The Reesville series consists of deep, somewhat poorly drained soils on uplands. Permeability is moderate in the subsoil and in the upper part of the substratum and is moderately slow in the lower part of the substratum. The soils formed in loess. Slopes are 0 to 1 percent.

Reesville soils are adjacent to and mapped in complex with somewhat poorly drained Fincastle soils. Reesville soils are commonly adjacent to poorly drained Cyclone soils and moderately well drained Xenia soils. The Fincastle soils formed in 22 to 40 inches of loess and in the underlying glacial till. The Cyclone soils have a thicker, darker surface layer than the Reesville soils and are in depressions. The Xenia soils are not grayish in the subsurface layer and formed in 22 to 30 inches of loess and in the underlying glacial till. They are in the higher or more sloping areas.

Typical pedon of Reesville silt loam, in a cultivated area of Fincastle-Reesville silt loams, 0 to 1 percent slopes, 2,250 feet west and 300 feet south of the northeast corner of sec. 22, T. 10 N., R. 1 W.

Ap—0 to 10 inches; dark grayish brown (10YR 4/2) silt loam, light brownish gray (10YR 6/2) dry; weak medium granular structure; friable; common fine very dark brown (10YR 2/2) accumulations of iron and manganese oxide; neutral; abrupt smooth boundary

E—10 to 13 inches; grayish brown (10YR 5/2) silt loam; common medium distinct yellowish brown (10YR 5/6) mottles; moderate thin platy structure parting to moderate fine granular; friable; neutral; clear smooth boundary

Bt1—13 to 20 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; thin continuous gray (10YR 5/1) clay films on faces of peds; common fine very dark gray (10YR 3/1) accumulations of iron and manganese oxide; slightly acid; clear wavy boundary

Bt2—20 to 40 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin continuous gray (10YR 5/1) clay films on faces of peds; neutral; clear wavy boundary

Bt3—40 to 45 inches; yellowish brown (10YR 5/6) silt loam; common fine distinct grayish brown (10YR 5/2) mottles; weak medium subangular blocky structure; firm; thin discontinuous gray (10YR 5/1) clay films on faces of peds; few fine black (10YR 2/1) accumulations of iron and manganese oxide; neutral; clear wavy boundary

BC—45 to 52 inches; yellowish brown (10YR 5/6) silt loam; many fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; neutral; clear wavy boundary

C—52 to 56 inches; yellowish brown (10YR 5/6) silt loam; many fine distinct grayish brown (10YR 5/2) mottles; moderate medium platy rock structure; firm; strong effervescence; moderately alkaline; clear wavy boundary

2C—56 to 60 inches; yellowish brown (10YR 5/6) loam; moderate thin platy rock structure; very firm; 4 percent gravel; strong effervescence; mildly alkaline.

The solum is 50 to 60 inches thick. The thickness of the loess ranges from 40 to 60 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2. The Bt horizon has hue of 10YR, value of 5, and chroma of 2 to 6. It is slightly acid or neutral. The C and 2C horizons are mildly alkaline or moderately alkaline. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 4 to 6. The 2C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 to 6.

Rodman Series

The Rodman series consists of excessively drained soils that are shallow to sand and gravel. These soils are on river terraces. Permeability is very rapid. The soils formed in sand and gravel. Slopes range from 35 to 60 percent.

Rodman soils are commonly adjacent to well drained Alvin, Edean, Fox, and Ockley soils. All of those soils have a lighter colored surface layer than the Rodman soils, contain more clay in the subsoil, have a thicker solum, and are less sloping.

Typical pedon of Rodman gravelly coarse sandy loam, 35 to 60 percent slopes, in a wooded area; 700 feet east and 1,360 feet south of the northwest corner of sec. 29, T. 8 N., R. 1 W.

A—0 to 5 inches; very dark grayish brown (10YR 3/2) gravelly coarse sandy loam, dark yellowish brown (10YR 4/4) dry; weak fine granular structure; very friable; 25 percent gravel; neutral; clear smooth boundary.

Bw—5 to 14 inches; yellowish brown (10YR 5/4) gravelly coarse sandy loam; weak fine granular structure; very friable; 25 percent gravel; neutral; clear wavy boundary.

C—14 to 60 inches; brown (10YR 5/3) stratified very gravelly coarse sand and lenses of coarse sand and fine sand; single grain; loose; 50 percent gravel; violent effervescence; moderately alkaline.

The solum is 10 to 15 inches thick. The A horizon has hue of 10YR, value of 3, and chroma of 1 or 2 and is loam, sandy loam, coarse sandy loam, or the gravelly analogs of those textures. The Bw horizon has hue of 10YR or 7.5YR, value of 3 to 5, and chroma of 3 or 4. It is sandy loam, coarse sandy loam, loam, or gravelly analogs of those textures. It is neutral or mildly alkaline. The C horizon has hue of 10YR, value of 3 to 5, and chroma of 2 to 4. It mainly is gravelly or very gravelly coarse sand but has thin strata of fine sand, sand, or coarse sand.

Ross Series

The Ross series consists of deep, well drained, moderately permeable soils on flood plains. The soils formed in recent loamy alluvium. Slopes range from 0 to 2 percent.

Ross soils are commonly adjacent to well drained Gessie soils. The Gessie soils have a lighter colored surface layer than the Ross soils and are on slightly lower flood plains.

Typical pedon of Ross silt loam, rarely flooded, in a cultivated field; 1,000 feet west and 1,000 feet north of the center of sec. 6, T. 8 N., R. 1 W.

Ap—0 to 8 inches; very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak medium subangular blocky structure; friable; neutral; abrupt smooth boundary.

A—8 to 24 inches; very dark grayish brown (10YR 3/2) silt loam, brown (10YR 5/3) dry; weak fine subangular blocky structure; friable; neutral; gradual wavy boundary.

Bw1—24 to 32 inches; very dark grayish brown (10YR 3/2) loam, brown (10YR 5/3) dry; weak medium and fine subangular blocky structure; friable; thin continuous very dark grayish brown (10YR 3/2) organic films on faces of peds; neutral; gradual wavy boundary.

Bw2—32 to 36 inches; dark brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) organic films on faces of peds; neutral; gradual wavy boundary.

C—36 to 60 inches; brown (10YR 5/3) stratified loam and sandy loam; massive; friable; slight effervescence; moderately alkaline.

The solum is 24 to 45 inches thick. The mollic epipedon is 24 to 36 inches thick.

The Ap, A, and Bw1 horizons have hue of 10YR, value of 3, and chroma of 2 or 3 and are silt loam or loam. The Bw1 and Bw2 horizons are neutral or mildly alkaline. The Bw2 horizon has hue of 10YR, value of 4 or 5, and chroma of 3 or 4. It mainly is stratified loam or silt loam. It has thin strata of fine sandy loam in some pedons. The C horizon has hue of 10YR, value of 4 to 6, and chroma of 3 or 4. It mainly is stratified loam, silt loam, or sandy loam, but the lower part of some pedons is gravelly sandy loam. This horizon is moderately alkaline or mildly alkaline.

Rossmoyne Series

The Rossmoyne series consists of deep, moderately well drained soils on uplands. These soils have a fragipan. Permeability is moderate above the fragipan and slow in and below the fragipan. The soils formed in loess, silty glacial drift, and loamy till. Slopes range from 0 to 6 percent.

Rossmoyne soils are commonly adjacent to somewhat poorly drained Avonburg soils and well drained Cincinnati soils. The Avonburg soils are dominantly grayish in the upper part of the subsoil and are on the broader ridges. The Cincinnati soils do not have grayish mottles and are generally more sloping than the Rossmoyne soils.

Typical pedon of Rossmoyne silt loam, 2 to 6 percent slopes, eroded, in a wheat field; 510 feet south and 1,030 feet east of the northwest corner of sec. 5, T. 12 N., R. 12 E.

Ap—0 to 7 inches; brown (10YR 5/3) silt loam, very pale brown (10YR 7/3) dry; moderate medium granular structure; friable; many very fine and medium roots; few specks of yellowish brown (10YR 5/6) subsoil material; 4 percent very fine sand and sand; slightly acid; abrupt smooth boundary.

Bt1—7 to 14 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; many very fine, fine, and medium roots; thin continuous dark brown (7.5YR 4/4) clay

films on faces of peds; thin continuous pale brown (10YR 6/3) silt films on faces of peds; extremely acid; clear wavy boundary.

Bt2—14 to 21 inches; yellowish brown (10YR 5/6) silty clay loam; common fine prominent grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; many very fine, fine, and medium roots; thin continuous dark brown (7 5YR 4/4) clay films on faces of peds, thick continuous pale brown (10YR 6/3) silt films on faces of peds, very strongly acid; clear wavy boundary.

Btx1—21 to 24 inches; brown (7.5YR 5/4) silty clay loam; strong coarse prismatic structure; very firm; common medium flattened roots; many very fine inped tubular pores; thin continuous dark brown (7 5YR 4/4) clay films on faces of peds; thin discontinuous brown (10YR 5/3) clay films within silt films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt films on faces of peds; very strongly acid; gradual wavy boundary.

Btx2—24 to 31 inches, brown (7 5YR 5/4) silt loam, strong very coarse prismatic structure parting to strong thick platy; very firm; brittle; few medium flattened roots along prism walls; common very fine inped vesicular pores; thin continuous dark brown (7 5YR 4/4) clay films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt films on faces of peds; very strongly acid; clear wavy boundary

2Btx3—31 to 46 inches; yellowish brown (10YR 5/6) silt loam that has noticeable sand; strong very coarse prismatic structure parting to strong thick platy; very firm; brittle; few fine flattened roots between prisms, common inped very fine vesicular pores; thin continuous dark brown (7 5YR 4/4) clay films on faces of peds; thick continuous light brownish gray (10YR 6/2) silt films on faces of peds; very strongly acid; clear wavy boundary

3Btx4—46 to 56 inches; yellowish brown (10YR 5/6) clay loam; strong very coarse prismatic structure parting to strong thick platy; very firm; brittle; few fine flattened roots along vertical faces of prisms; common very fine inped vesicular pores, thin continuous dark brown (7 5YR 4/4) clay films on faces of peds; medium continuous light brownish gray (10YR 6/2) silt films on faces of peds; 3 percent gravel; very strongly acid; gradual wavy boundary.

3Btx5—56 to 65 inches; yellowish brown (10YR 5/6) clay loam; strong very coarse prismatic structure parting to strong thick platy; very firm; brittle; few medium flattened roots along vertical faces of prisms; few inped very fine vesicular pores; thin continuous dark brown (7 5YR 4/4) clay films on faces of peds, 3 percent gravel; very strongly acid; gradual wavy boundary

3BC—65 to 75 inches; yellowish brown (10YR 5/6) clay loam; moderate coarse subangular blocky structure; firm; very few medium roots along faces of peds; thin discontinuous yellowish brown (10YR 5/4) clay films on faces of peds; 3 percent gravel; strongly acid; gradual wavy boundary.

3C—75 to 80 inches; yellowish brown (10YR 5/6) clay loam; moderate medium platy rock structure; very firm; 3 percent gravel; slightly acid.

The solum is 70 to 100 inches thick. The loess is 18 to 40 inches thick. The silty glacial drift is 10 to 40 inches thick

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Bt and Btx horizons have hue of 10YR or 7.5YR, value of 5, and chroma of 4 to 6. They are silt loam or silty clay loam and are extremely acid to strongly acid. The 2Btx horizon is similar in color and texture to the 2Btx horizon but has noticeable sand. It is strongly acid or very strongly acid. The 3Btx, 3BC, and 3C horizons are loam or clay loam. The 3Btx horizon has hue of 10YR, value of 4 or 5, and chroma of 4 to 6. It is very strongly acid to medium acid. The 3BC and 3C horizons have hue of 10YR and value and chroma of 4 to 6. The 3BC horizon is strongly acid to neutral. The 3C horizon is medium acid to moderately alkaline

Russell Series

The Russell series consists of deep, well drained soils on uplands. Permeability is moderate in the subsoil and moderately slow in the substratum. The soils formed in loess and the underlying loamy glacial till. Slopes range from 0 to 6 percent.

Russell soils are commonly adjacent to well drained Sidell soils and moderately well drained Xenia soils. The Sidell soils have a darker colored surface layer than the Russell soils. The Xenia soils have grayish mottles in the upper 10 inches of the subsoil and are lower on the landscape than the Russell soils.

Typical pedon of Russell silt loam, 1 to 6 percent slopes, eroded, in a cultivated field; 970 feet south and 1,100 feet east of the center of sec. 5, T. 12 N., R. 13 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few specks of yellowish brown (10YR 5/4) material from the subsoil; slightly acid; abrupt smooth boundary.

Bt1—8 to 27 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary

2Bt2—27 to 30 inches; yellowish brown (10YR 5/4) silty clay loam; noticeable sand; moderate medium subangular blocky structure; firm; thin continuous

dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear wavy boundary.

2Bt3—30 to 36 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds, 3 percent gravel, medium acid; clear smooth boundary

2Bt4—36 to 42 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (7.5YR 4/4) clay films on faces of peds; 3 percent gravel, slightly acid; clear wavy boundary.

2BC—42 to 50 inches, brown (10YR 5/3) clay loam; moderate medium subangular blocky structure; firm, thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; 3 percent gravel; neutral; clear wavy boundary

2C—50 to 60 inches, yellowish brown (10YR 5/4) loam; moderate medium platy rock structure; very firm; 5 percent gravel; slight effervescence; mildly alkaline.

The solum is 40 to 56 inches thick. The loess is 20 to 40 inches thick. Soft, calcareous shale and thin-bedded limestone bedrock are at a depth of 40 to 60 inches in the bedrock substratum phase.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Bt and 2Bt horizons have hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. The Bt horizon is silt loam or silty clay loam. The 2Bt horizon is silty clay loam, clay loam, or loam and is medium acid or slightly acid. The 2BC and 2C horizons have hue of 10YR, value of 5, and chroma of 3 or 4. The 2BC horizon is loam or clay loam and is neutral or mildly alkaline. The 2C horizon is mildly alkaline or moderately alkaline.

Sidell Series

The Sidell series consists of deep, well drained soils on side slopes and foot slopes on uplands. Permeability is moderate in the solum and moderately slow in the substratum. The soils formed in loess and the underlying loamy glacial till. Slopes range from 1 to 4 percent.

Sidell soils are commonly adjacent to well drained Russell soils. The Russell soils have a lighter colored surface layer than the Sidell soils.

Typical pedon of Sidell silt loam, 1 to 4 percent slopes, in a cultivated field; 900 feet north and 1,000 feet east of the southwest corner of sec. 36, T. 10 N., R. 1 W.

Ap—0 to 11 inches, very dark grayish brown (10YR 3/2) silt loam, grayish brown (10YR 5/2) dry; weak fine granular and subangular blocky structure; friable; neutral; abrupt smooth boundary

A—11 to 16 inches; very dark grayish brown (10YR 3/2) silt loam; moderate fine subangular blocky structure; firm; few fine roots; neutral; clear wavy boundary

Bt1—16 to 20 inches; dark yellowish brown (10YR 4/4) silty clay loam; moderate medium blocky structure; firm; few fine roots; thin discontinuous dark brown (10YR 4/3) clay films and very dark gray (10YR 3/1) organic films on faces of peds; slightly acid; clear wavy boundary

Bt2—20 to 27 inches, yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; few fine roots, thin discontinuous dark brown (10YR 4/3) and dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary

Bt3—27 to 37 inches; yellowish brown (10YR 5/4) silt loam; moderate medium subangular blocky structure; friable, thin patchy dark brown (10YR 4/3) clay films on faces of peds, neutral; gradual wavy boundary.

2BC—37 to 47 inches; yellowish brown (10YR 5/4) and dark yellowish brown (10YR 4/4) loam; weak medium subangular blocky structure; friable; thin patchy dark brown (10YR 4/3) clay films on faces of peds; firm; strong effervescence; mildly alkaline; gradual wavy boundary

2C—47 to 60 inches; yellowish brown (10YR 5/4) loam; common medium faint light brownish gray (10YR 6/2) and yellowish brown (10YR 5/8) mottles, moderate medium platy rock structure; firm, violent effervescence; moderately alkaline

The solum is 40 to 66 inches thick. The loess is 22 to 40 inches thick.

The A horizon has hue of 10YR, value of 3, and chroma of 1 to 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It is silt loam or silty clay loam and is slightly acid or neutral. Some pedons have a 2Bt horizon, which is loam or clay loam. The 2Bt and 2BC horizons have hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The 2BC horizon is neutral or mildly alkaline. The 2C horizon has hue of 10YR, value of 5, and chroma of 3 or 4.

Uniontown Series

The Uniontown series consists of deep, moderately well drained and well drained, moderately permeable soils on terraces. The soils formed in silty lacustrine sediments. Slopes range from 2 to 25 percent.

Uniontown soils are commonly adjacent to well drained Eden soils. The Eden soils formed in residuum, have more clay in the solum than the Uniontown soils, have paralithic bedrock at a depth of less than 40 inches, and are in the higher areas.

Typical pedon of Uniontown silt loam, moderately wet, 2 to 8 percent slopes, in a cultivated field; 2,000 feet west and 1,100 feet north of the southeast corner of sec. 18, T. 11 N., R. 13 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; weak medium granular structure; friable; neutral; abrupt smooth boundary
Bt1—8 to 15 inches; brown (10YR 4/3) silt loam; moderate fine subangular blocky structure; firm; thin patchy dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; clear wavy boundary
Bt2—15 to 29 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; slightly acid; gradual wavy boundary
Bt3—29 to 40 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear wavy boundary
Bt4—40 to 48 inches; yellowish brown (10YR 5/6) silty clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; moderate coarse subangular blocky structure; firm; thin continuous pale brown (10YR 6/3) clay films on faces of peds; neutral; clear smooth boundary
C1—48 to 56 inches; yellowish brown (10YR 5/6) silty clay loam; many medium prominent light brownish gray (2.5Y 6/2) mottles; massive and moderate thick platy rock structure; firm; neutral; clear smooth boundary
C2—56 to 60 inches; light brownish gray (2.5Y 6/2) stratified silty clay loam and silt loam; many medium prominent yellowish brown (10YR 5/6) mottles; massive and moderate thick platy rock structure; firm; black (10YR 2/1) accumulations of iron and manganese oxide; strong effervescence; moderately alkaline.

The solum is 30 to 48 inches thick. The A horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Bt horizon has hue of 10YR or 2.5Y, value of 4 or 5, and chroma of 3 to 6 and is slightly acid or neutral. The C horizon has hue of 10YR or 2.5Y, value of 4 to 6, and chroma of 2 to 6. It is silt loam or silty clay loam and is neutral to moderately alkaline.

Weisburg Series

The Weisburg series consists of deep, well drained soils on uplands. These soils have a fragipan. Permeability is moderate above the fragipan and very slow in and below the fragipan. The soils formed in loess, loamy and clayey glacial till, and clayey material weathered from the underlying interbedded, soft, calcareous shale and thin-bedded limestone bedrock. Slopes range from 2 to 6 percent.

Weisburg soils are similar to Cincinnati soils and are commonly adjacent to Carmel soils. The Cincinnati soils have less clay and more sand in the lower part of the subsoil than the Weisburg soils. The Carmel soils did not form in glacial till, do not have a fragipan, and are on the lower hillsides.

Typical pedon of Weisburg silt loam, 2 to 6 percent slopes, eroded, in a pasture, 990 feet south and 528 feet east of the northwest corner of sec. 24, T. 8 N., R. 2 W.

Ap—0 to 6 inches; dark brown (10YR 4/3) silt loam, light yellowish brown (10YR 6/4) dry; weak fine subangular blocky structure; friable; common fine roots; neutral; abrupt smooth boundary
Bt—6 to 16 inches; yellowish brown (10YR 5/6) silt loam; moderate medium subangular blocky structure; firm; few very fine roots; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; medium acid; clear smooth boundary
Btx1—16 to 23 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; strong coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; few fine flattened roots on faces of prisms; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of prisms; many light brownish gray (10YR 6/2) silt films on faces of prisms; strongly acid; clear wavy boundary.
Btx2—23 to 29 inches; yellowish brown (10YR 5/6) silt loam; common medium distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; few fine flattened roots on faces of prisms; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of prisms; many light brownish gray (10YR 6/2) silt films on faces of prisms; strongly acid; clear smooth boundary
2Btx3—29 to 39 inches; yellowish brown (10YR 5/6) clay loam; common medium distinct light brownish gray (10YR 6/2) mottles; strong very coarse prismatic structure parting to moderate medium subangular blocky; very firm; brittle; few medium flattened roots along prism walls; thin discontinuous dark yellowish brown (10YR 4/4) clay films on faces of peds; many light brownish gray (10YR 6/2) silt films on faces of prisms; 4 percent gravel; strongly acid; clear smooth boundary
2Bt1—39 to 53 inches; yellowish brown (10YR 5/6) clay; strong medium subangular blocky structure; firm; few medium flattened roots on faces of peds; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; 4 percent gravel; strongly acid; clear smooth boundary
2Bt2—53 to 62 inches; yellowish brown (10YR 5/6) silty clay; moderate medium subangular blocky structure; firm; very few medium and fine roots on faces of peds; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; many medium black (10YR 2/1) manganese oxide stains on faces

of peds; 3 percent gravel; slightly acid; clear wavy boundary

3BC—62 to 72 inches; yellowish brown (10YR 5/6) silty clay; common medium distinct light gray (2.5Y 7/2) mottles; moderate fine subangular blocky structure; firm; very few medium roots on faces of peds; thin discontinuous dark yellowish brown (10YR 4/4) and yellowish brown (10YR 5/4) clay films on faces of peds; many medium black (10YR 2/1) manganese oxide stains on faces of peds; slight effervescence; mildly alkaline; clear wavy boundary.

3Cr—72 inches; interbedded, soft, calcareous shale and limestone bedrock.

The solum is at least 60 inches thick. The loess is 22 to 40 inches thick. The glacial till is 24 to 40 inches thick. The depth to clayey residuum is 48 to 72 inches. The depth to the fragipan is 20 to 34 inches.

The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 2 to 4. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 4 to 6. It is silt loam or silty clay loam and is strongly acid to slightly acid. The Btx horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. The 2Btx horizon is similar in color to the Btx horizon. It is silt loam, silty clay loam, loam, or clay loam. It is strongly acid or very strongly acid. The 2Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 to 6. It is silty clay or clay and is 1 to 5 percent gravel. It is strongly acid to slightly acid. The 3BC horizon has hue of 10YR or 7.5YR and value and chroma of 4 to 8. It is silty clay or clay and is neutral or mildly alkaline.

Williamstown Series

The Williamstown series consists of deep, moderately well drained soils on uplands. The soils are moderately permeable in the subsoil and moderately slowly permeable in the substratum. They formed in a thin mantle of loess and the underlying loamy glacial till. Slopes range from 1 to 4 percent.

Williamstown soils are similar to Xenia soils and commonly are adjacent to somewhat poorly drained Fincastle and well drained Miami soils. The Xenia and Fincastle soils have a thicker solum than the Williamstown soils and formed in 20 to 40 inches of loess. The Fincastle soils have a low-chroma matrix or have films in the E horizon and the upper part of the B horizon. They are more nearly level than the Williamstown soils. The Miami soils do not have low-chroma mottles in the solum and are on the higher swells.

Typical pedon of Williamstown silt loam, 1 to 4 percent slopes, in a cultivated field; 1,100 feet west and 1,710 feet south of the northeast corner of sec. 2, T. 6 W., R. 1 W.

Ap—0 to 8 inches; brown (10YR 4/3) silt loam; moderate medium granular structure; friable; slightly acid; abrupt smooth boundary

Bt1—8 to 14 inches; dark yellowish brown (10YR 4/4) clay loam; few fine faint dark grayish brown (10YR 4/2) mottles; moderate fine subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; 1 percent gravel; medium acid; clear smooth boundary.

Bt2—14 to 18 inches; yellowish brown (10YR 5/4) clay loam; common fine distinct dark grayish brown (10YR 4/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; 1 percent gravel; medium acid; clear wavy boundary.

Bt3—18 to 26 inches; yellowish brown (10YR 5/4) clay loam; few fine faint dark yellowish brown (10YR 4/4) mottles; moderate coarse subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on faces of peds; 2 percent gravel; slightly acid; clear wavy boundary

BC—26 to 32 inches; yellowish brown (10YR 5/4) loam; common fine distinct dark grayish brown (10YR 4/2) mottles; moderate and weak coarse subangular blocky structure; firm; thin discontinuous brown (10YR 4/3) clay films on faces of peds; 3 percent gravel; slight effervescence; mildly alkaline; clear wavy boundary

C—32 to 60 inches; pale brown (10YR 6/3) loam; few fine dark grayish brown (10YR 4/2) mottles; massive; very firm; 4 percent gravel; strong effervescence; moderately alkaline.

The solum is 30 to 40 inches thick. The loess is 4 to 19 inches thick.

The Ap and Bt horizons are neutral to medium acid. The Ap horizon has hue of 10YR, value of 4 or 5, and chroma of 3. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. It dominantly is clay loam. Where the loess is at its maximum thickness, however, the horizon ranges to silty clay loam in the upper part. The BC horizon has hue of 10YR, value of 4 to 6, and chroma of 3 to 6. It is slightly acid to mildly alkaline. The C horizon has hue of 10YR, value of 5 or 6, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Wirt Series

The Wirt series consists of deep, well drained, moderately permeable soils on flood plains. The soils formed in recent loamy alluvium. Slopes range from 0 to 2 percent.

Wirt soils are similar to Gessie soils and are commonly adjacent to moderately well drained Oldenburg soils. The Gessie soils are calcareous in the upper 40 inches and are on downstream flood plains. The Oldenburg soils

have grayish mottles within a depth of 20 inches and are lower on the landscape than the Wirt soils.

Typical pedon of Wirt loam, occasionally flooded, in a cultivated field; 300 feet west and 430 feet north of the southeast corner of sec. 23, T. 10 N., R. 11 E.

Ap—0 to 8 inches; dark brown (10YR 4/3) loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; neutral; abrupt smooth boundary

Bw1—8 to 26 inches, brown (10YR 4/3) loam; weak fine subangular blocky structure; friable; thin continuous dark brown (10YR 3/3) organic films on faces of peds, neutral; gradual wavy boundary

Bw2—26 to 40 inches, brown (10YR 5/3) loam; weak fine subangular blocky structure; friable; thin continuous dark brown (10YR 4/3) organic films on faces of peds; neutral; gradual wavy boundary

C—40 to 60 inches; dark brown (10YR 4/3) loam; massive; friable, neutral

The solum is 24 to 40 inches thick. It is loam or silt loam.

The Ap horizon has hue of 10YR, value of 4, and chroma of 2 or 3. The Bw and C horizons have hue of 10YR, value of 4 or 5, and chroma of 3 or 4. The Bw horizon is neutral or slightly acid. The C horizon is loam or sandy loam.

Woolper Series

The Woolper series consists of deep, well drained, slowly permeable soils on foot slopes on uplands. The soils formed in silty and clayey colluvium. Slopes range from 1 to 6 percent.

The Woolper soils in this survey area do not have an argillic horizon, which is definitive for the Woolper series. This difference does not alter the behavior or usefulness of the soils.

Woolper soils are commonly adjacent to well drained Eden soils. The Eden soils are shallower to bedrock than the Woolper soils, have more flagstones and channers, and are on the higher, more sloping side slopes.

Typical pedon of Woolper silty clay loam, 1 to 6 percent slopes, in a hay field; 2,350 feet east and 1,375 feet south of the northwest corner of sec. 2, T. 11 N., R. 13 W.

Ap1—0 to 5 inches, very dark grayish brown (10YR 3/2) silty clay loam, grayish brown (10YR 5/2) dry; moderate fine subangular blocky structure; firm; common very fine roots; neutral; abrupt smooth boundary

Ap2—5 to 9 inches, dark brown (10YR 3/3) silty clay loam, grayish brown (10YR 5/2) dry; strong coarse angular blocky structure; very firm; few very fine roots; neutral; clear smooth boundary.

Bt1—9 to 19 inches, dark brown (10YR 3/3) silty clay, grayish brown (10YR 5/2) dry; strong medium angular blocky structure; very firm; few very fine roots; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds; neutral; clear wavy boundary

Bt2—19 to 25 inches, brown (10YR 4/3) silty clay, strong medium angular blocky structure; very firm; thin continuous very dark grayish brown (10YR 3/2) clay films on faces of peds, neutral; gradual smooth boundary

Bt3—25 to 41 inches, brown (10YR 4/3) silty clay; weak medium prismatic structure parting to strong medium angular blocky; very firm; thin continuous dark brown (10YR 3/3) clay films on faces of peds, neutral; gradual smooth boundary

Bt4—41 to 61 inches; dark yellowish brown (10YR 4/4) silty clay; strong medium angular blocky structure, very firm; thin continuous dark grayish brown (10YR 4/2) clay films on faces of peds; neutral, gradual smooth boundary

BC—61 to 80 inches; dark yellowish brown (10YR 4/4) silty clay; weak medium subangular blocky structure; firm; thin patchy grayish brown (10YR 5/2) clay films on faces of peds, neutral.

The solum is at least 48 inches thick. It is slightly acid to mildly alkaline. The depth to paralithic limestone and shale is more than 60 inches. The content of coarse fragments ranges from 0 to 10 percent.

The Ap horizon has hue of 10YR, value of 3, and chroma of 2 or 3. The Bt1, Bt2, and Bt3 horizons have hue of 10YR, value of 3 or 4, and chroma of 2 to 4. They are silty clay or clay. The Bt4 and BC horizons also are silty clay or clay. They have hue of 10YR, value of 4 or 5, and chroma of 3 or 4.

Wynn Series

The Wynn series consists of moderately deep, well drained, slowly permeable soils on uplands. The soils are formed in loess, loamy glacial till, and clayey material weathered from interbedded, soft, calcareous shale and thin-bedded limestone bedrock. Slopes range from 1 to 12 percent.

Wynn soils are similar to Bonnell, Carmel, and Edenton soils and are commonly adjacent to well drained Carmel and Miami soils. The Bonnell soils formed in a thin layer of loess and in till and have a thicker solum than the Wynn soils. The Carmel soils are deeper to bedrock than the Wynn soils and formed in a thin layer of loess and in clayey residuum. The Edenton soils have a thinner loess mantle than the Wynn soils and formed in loess, glacial till, and clayey residuum. The Miami soils have less clay in the subsoil than the Wynn soils and are deeper to bedrock. They are on the upper side slopes and on ridgetops.

Typical pedon of Wynn silt loam, 6 to 12 percent slopes, eroded, in a cultivated field; 260 feet south and

2,240 feet east of the northwest corner of sec. 22, T. 9 N., R. 2 W

Ap—0 to 7 inches; dark yellowish brown (10YR 4/4) silt loam, pale brown (10YR 6/3) dry; weak very fine subangular blocky structure; friable; specks of yellowish brown (10YR 5/4) subsoil material; common very fine roots; medium acid; abrupt smooth boundary

Bt1—7 to 11 inches; yellowish brown (10YR 5/4) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous brown (10YR 4/3) clay films on faces of peds; common fine roots; medium acid; clear wavy boundary

2Bt2—11 to 24 inches; yellowish brown (10YR 5/4) clay loam; moderate medium subangular blocky structure; firm; few very fine roots; thin continuous brown (10YR 4/3) clay films on faces of peds; neutral; clear wavy boundary

3Bt3—24 to 30 inches; light olive brown (2.5Y 5/4) silty clay; common fine prominent pale olive (5Y 6/3) mottles; moderate medium angular and subangular blocky structure; firm; few very fine roots; thin continuous olive brown (2.5Y 4/4) clay films on faces of peds; 5 percent flagstones and channers; neutral; abrupt wavy boundary

3Cr—30 inches; interbedded, soft, calcareous shale and thin-bedded limestone bedrock.

The thickness of the solum, or the depth to bedrock, is 20 to 40 inches. The loess is 10 to 22 inches thick.

The Ap horizon is dominantly silt loam but is silty clay loam in severely eroded areas. The Bt and 2Bt horizons are medium acid to neutral. The Bt horizon has hue of 10YR or 7.5YR, value of 4 or 5, and chroma of 3 or 4. It is silty clay loam or silt loam. The 2Bt horizon has hue of 10YR, 7.5YR, or 2.5Y, value of 3 to 5, and chroma of 3 to 6. It is clay loam or clay. The 3Bt horizon has hue of 2.5Y or 5Y, value of 3 to 5, and chroma of 3 to 6. It is silty clay or clay and is neutral to moderately alkaline.

Wynn silt loam, 1 to 6 percent slopes, has less clay than is definitive for the Wynn series, but this difference does not alter the usefulness or behavior of the soil.

Xenia Series

The Xenia series consists of deep, moderately well drained, moderately slowly permeable soils on uplands. The soils formed in loess and the underlying loamy glacial till. Slopes range from 0 to 6 percent.

Xenia soils are similar to Williamstown soils and are commonly adjacent to somewhat poorly drained Fincastle and Reesville soils and well drained Russell soils. The solum and the loess mantle of the Williamstown soils are thinner than those of the Xenia soils. The Fincastle and Reesville soils are dominantly grayish in the subsurface layer and the upper part of the subsoil and are lower on the landscape than the Xenia soils. The Russell soils do not have grayish mottles and generally are higher on the landscape than the Xenia soils.

Typical pedon of Xenia silt loam, 2 to 6 percent slopes, eroded, in a cultivated field; 500 feet south and 100 feet east of the northwest corner of sec. 14, T. 9 N., R. 2 W

Ap—0 to 9 inches; brown (10YR 4/3) silt loam, pale brown (10YR 6/3) dry; moderate medium granular structure; friable; few specks of yellowish brown (10YR 5/4) subsoil material; neutral; abrupt smooth boundary

Bt1—9 to 15 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate fine subangular blocky structure; firm; thin continuous yellowish brown (10YR 5/4) clay films on faces of peds; neutral; clear wavy boundary

Bt2—15 to 25 inches; yellowish brown (10YR 5/6) silty clay loam; common fine distinct grayish brown (10YR 5/2) mottles; moderate medium subangular blocky structure; firm; thin continuous dark yellowish brown (10YR 4/4) clay films on faces of peds; neutral; clear smooth boundary

2Bt3—25 to 28 inches; yellowish brown (10YR 5/6) silty clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; 2 percent gravel; neutral; clear wavy boundary

2Bt4—28 to 38 inches; yellowish brown (10YR 5/6) clay loam; moderate medium subangular blocky structure; firm; thin continuous dark brown (10YR 4/3) clay films on faces of peds; 5 percent gravel; neutral; clear wavy boundary

2BC—38 to 45 inches; yellowish brown (10YR 5/4) loam; common fine distinct grayish brown (10YR 5/2) mottles; weak coarse subangular blocky structure; firm; thin patchy yellowish brown (10YR 5/4) clay films on faces of peds; 5 percent gravel; slight effervescence; mildly alkaline; gradual wavy boundary

2C—45 to 60 inches; yellowish brown (10YR 5/4) loam; massive; very firm; 5 percent gravel; strong effervescence; mildly alkaline.

The solum is 36 to 65 inches thick. The loess is 22 to 30 inches thick.

The Bt and 2Bt horizons are medium acid to neutral. The Bt horizon has hue of 10YR, value of 4 or 5, and chroma of 3 to 6. The 2Bt and 2BC horizons are similar in color to the Bt horizon. The 2BC horizon is clay loam or loam. The 2C horizon has hue of 10YR, value of 5, and chroma of 3 or 4. It is mildly alkaline or moderately alkaline.

Formation of the Soils

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This section describes the effects of the five soil-forming factors on the soils in Franklin County. It also describes the processes of soil formation.

Factors of Soil Formation

Soil forms through processes acting on deposited or accumulated geologic material. The characteristics of the soil at any given point are determined by (1) the physical and mineralogical composition of the parent material, (2) the climate under which the soil material accumulated and has existed since accumulation, (3) the plant and animal life on and in the soil, (4) the relief, or lay of the land, and (5) the length of time that the forces of soil formation have acted on the soil material.

Climate and plant and animal life are active factors of soil formation. They act on the parent material that has accumulated through the weathering of rocks and the deposition of sediments from glacial ice or stream water. They slowly change the parent material to a natural body that has genetically related horizons. The effects of climate and plant and animal life are conditioned by relief. The parent material affects the kind of soil profile that forms and, in extreme cases, determines it almost entirely. Finally, time is needed for changing the parent material into a soil. Some time is always required for the differentiation of soil horizons.

The factors of soil formation are so closely interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four.

Parent Material

Parent material is the unweathered or slightly altered material in which a soil forms. It determines the chemical and mineralogical composition of the soil. The soils in Franklin County formed in glacial till, windblown loess and sand, outwash, alluvium, lacustrine sediments, and bedrock residuum.

Most of the soils in Franklin County formed in glacial deposits of the Pleistocene age. Glacial till is unconsolidated material deposited by glacial ice. It consists of particles of different sizes, including pebbles and boulders, that are mixed together. The unweathered glacial till in Franklin County is calcareous and loamy. Two examples of soils that formed dominantly in glacial till are the Miami and Bonnell soils.

At least two major periods of Pleistocene glaciation, the Illinoian and the Wisconsin, occurred in Franklin County (*12*).

The Illinoian glacier advanced to the south across the entire county, and soils in about two-thirds of the county, including the Avonburg, Bonnell, Cincinnati, and Rossmoyne soils, formed dominantly in Illinoian-age glacial till. They began to form about 150,000 years ago, at the end of the Illinoian glaciation. Some of them were eroded, and in places most of the profile was removed. Then, around 20,000 years ago, the soils were covered with loess. These soils are typically weathered to a depth of 6 feet or more and, except for the Bonnell soils, they have a dense fragipan at a depth of 2 to 6 feet.

About 20,000 years ago, the Wisconsin glacier pushed into the northeast and extreme northwest parts of the county and advanced to the ridges of the Shelbyville moraine near Andersonville in the west and the Hartwell moraine north and west of Blooming Grove in the east (*11*). The East White sublobe is in the northwest corner of the county, and the Miami sublobe is in the northeast corner. There are no differences in the types of soils in these areas, although the underlying bedrock is different. Among the soils that formed dominantly in the Wisconsin glacial till are the Cyclone, Fincastle, Hennepin, Miami, Russell, and Xenia soils. These soils are weathered to a depth of about 3 or 4 feet.

During the time of glaciation, especially during the Wisconsin age, silty loess was deposited on much of the glacial till and on many of the soils formed in older till deposits. This deposit is called Peorian loess. The thickness of this loess is as much as 54 inches in the county. On the Illinoian till plain, below what is assumed to be Peorian loess of the Wisconsin age and loamy till of the Illinoian age, is material with much fine and very fine sand and no stones. This deposit must be older than the Peorian loess above it, but its age and origin are not known. It was deposited on an old erosional surface. In the description of the Cobbsfork soils, this material is called silty glacial drift.

Outwash material was deposited by running water from melting glaciers. The size of the particles of outwash material varies according to the speed of the stream that carried it. For example, when the velocity of water

decreased, the coarser particles were deposited first. Finer particles, such as very fine sand, silt, and clay, were carried along in the stream by slowly moving water. Outwash deposits are generally stratified with layers of similar-size particles. Coarse particles are dominant in Franklin County. The Alvin, Eldean, Fox, Ockley, and Rodman soils formed in outwash material on stream terraces. Most of these terraces or benches are 10 to 80 feet higher than the adjacent bottom land.

Lacustrine material was deposited in still, or ponded, water. Because the coarser particles dropped out of moving water as outwash, only the finer particles, such as very fine sand, silt, and clay, remained in the still water. Thus, lacustrine deposits in Franklin County are typically clayey or silty. Milford soils are an example of soils that formed in lacustrine material.

Alluvial material was deposited by the floodwater of existing streams in recent times. This sediment varies in texture because of the source of the alluvium and the speed of the water from which it was deposited. Most of the Whitewater River Valley is 100 feet or more deep over bedrock and is filled with alluvium or alluvium and outwash. Dearborn soils are an example of soils that formed in alluvium. They have a high content of limestone flagstones and channers because they are adjacent to steep hillsides of limestone and shale bedrock.

Underlying the glacial material in Franklin County, at depths averaging less than 25 feet, is bedrock formed from marine sediments laid down in two geologic ages. Most of the county is underlain by limestone and interbedded greenish gray (5GY 6/1), soft, calcareous shale. This bedrock is the Dillsboro Formation of the Ordovician age and is over 430 million years old (fig. 11). Many marine fossils are in this rock. The Eden soils formed entirely in material weathered from this limestone and soft shale. Some other soils, such as the Carmel, Edenton, and Wynn soils, formed partly in this material.

The bedrock dips to the southwest at a rate of about 2.5 to 3.3 feet per mile. The lowest exposure of the Dillsboro Formation in Franklin County is where the Whitewater River leaves the county at its southern boundary. At the higher elevations, the ratio of limestone to soft shale is greater. The Dillsboro Formation is overlain by the Saluda member of the Whitewater Formation. This rock is brownish gray dolomite with little or no shale and gives rise to less clayey soils. The contact between these two rock units is about 930 feet above sea level in a road cut along State Road 101, about 2.5 miles south of the Union County line.

The cap rock on the Saluda member is the Brassfield limestone. It forms many falls, such as Derbyshire Falls, west of Laurel. It is grayish limestone with reddish streaks and is of the Silurian age. It is at an elevation of 935 feet above sea level near Peppertown. The base of the Silurian limestone is at an elevation of about 910 to 940 feet. The thin, greenish gray shale of the Osgood member, which overlies the Brassfield limestone, gives rise to a more clayey inclusion in areas of Corydon soils. These soils are on steep hillsides in the northwest part of the county. Above the Osgood member is the Laurel member, which is brownish gray, sandy dolomite and has strata of chert. The chert layers are up to 6 inches thick. Strata of dolomite 4 to 15 inches thick separate the chert layers. The Laurel member is the parent material of the Corydon soils. The Osgood and Laurel members are exposed only in the areas west of Laurel and north of Hamburg (*3*).

Plant and Animal Life

Plants have been the principal organism influencing the soils in Franklin County; however, bacteria, fungi, earthworms, and the activities of man have also been important. The main contribution of plants and animal life is the addition of organic matter and nitrogen to the soil. The kind of organic material on and in a soil depends largely on the plants under which the soil formed. The remains of these plants accumulated on the surface, decayed, and eventually became organic matter. The roots of the plants provided channels for the downward movement of water and, as they decayed, added organic matter and nutrients that can be used by new plants.

The native vegetation in Franklin County consisted mainly of deciduous trees. Differences in natural soil drainage and parent material have affected the composition of the forest species. In general, the well drained upland soils, such as the Miami, Bonnell, and Eden soils, were covered with white oak, red oak, hickory, and poplar. The more poorly drained soils, such as the Avonburg, Cobbsfork, Cyclone, and Fincastle soils, were covered primarily by beech, sugar maple, green ash, blackgum, sweetgum, and pin oak.

Climate

Franklin County has a temperate, humid, mid-continental climate that is essentially uniform. Climate affects soil formation through its effects on weathering, vegetation, and erosion. Water from rains and melting snow seeps slowly downward through the soil and causes physical and chemical changes. The percolating water moves clay from the surface layer into the subsoil. The accumulation of the clay in the subsoil has taken place in most of the soils in the county. The percolating water dissolves minerals and moves them downward through the soil. As a result of this leaching, free calcium carbonate has been removed from the upper layers of many of the soils in the county. This leaching results in a reaction of slightly acid or medium acid in the upper layers of these soils.

The climate also influences the formation of soils by stimulating the growth of living organisms, particularly

Figure 11.—Falls on the thin-bedded limestone and soft shale of the Dillsboro Formation.

plants. The climate of the county has favored the growth of hardwood trees. Heavy, untimely, frequent rains can result in erosion if the soils are exposed during farming or construction activities. The processes of soil formation are slower when the ground is frozen.

Relief

Relief has had a marked influence on the soils of the county through its effects on natural drainage, erosion, plant cover, and soil temperature. Slopes in Franklin

County range from 0 to 60 percent. The soils in the county are excessively drained to very poorly drained.

Relief influences the formation of the soil by affecting runoff and drainage. Through its effect on aeration of the soil, drainage determines the color of the soil. Runoff is greatest on the steeper slopes. In low areas on broad, flat ridges, water is ponded and drains off slowly. Water and air move freely through the soils that are well drained and slowly through the soils that are very poorly drained. In well aerated soils the iron compounds that give most soils their color are bright colored and oxidized. Poorly aerated soils generally are a dull, mottled gray because there are no colored iron compounds or the iron is in a reduced state. The Miami soils are an example of well drained, well aerated soils, and the Cyclone soils are an example of poorly aerated, poorly drained soils.

Relief also affects soil temperature. The soils on south-facing slopes are generally hotter and drier than those on north-facing slopes.

Time

Generally, a long time is needed for distinct horizons to form in the soil. The degree of soil profile development reflects the length of time that the parent material has been in place. Some soils form rapidly; others form slowly.

The soils in Franklin County are young to mature. Many soils have distinct horizons because they formed in glacial deposits that have been exposed to the soil-forming processes for a long time. Soils that formed in recent alluvial sediments have not been in place long enough for distinct horizons to develop. Gessie and Moundhaven are examples of young soils formed in alluvial material.

The Miami and Cincinnati soils, both of which are on uplands, show the effect of time on leaching. The Cincinnati soils, which formed mainly in the older Illinoian till, are strongly developed and are leached of lime to a depth of more than 80 inches. The Miami soils, which formed mainly in the younger Wisconsin till, typically are leached to a depth of only 34 inches.

Processes of Soil Formation

Several processes have been involved in the formation of the soils in this county. These processes are the accumulation of organic matter; the solution, transfer, and removal of calcium carbonates and bases; the liberation and translocation of silicate clay minerals; and the reduction and transfer of iron. In most soils more than one of these processes have been active in horizon differentiation.

Some organic matter has accumulated in the surface layer of all the soils in the county. The organic matter content of some soils is very low, but that of others is moderate. Generally, the soils that have the most organic matter, such as the Cyclone and Milford soils, have a thick, dark surface soil.

Carbonates and bases have been leached from the upper horizons of nearly all the soils in this county. Leaching probably preceded the translocation of silicate clay minerals. Nearly all of the carbonates and some of the bases have been leached from the A and B horizons of the well drained soils. Even in the wettest soils, some leaching is indicated by the absence of carbonates and by an acid or neutral reaction. Leaching of wet soils is slow because of a high water table or because water moves slowly through such soils.

Clay accumulates in pores and other voids and forms films on the surfaces along which water moves. The leaching of bases and the translocation of silicate clays are among the more important processes of horizon differentiation in the soils of this county. The Miami soils are an example of soils in which translocated silicate clay in the form of clay films has accumulated in the Bt horizon.

Gleying, or reduction and transfer of iron, has occurred in all of the very poorly drained and poorly drained soils in this county. In these naturally wet soils, this process has significantly affected horizon differentiation. A grayish color in the subsoil indicates the reduction of iron compounds. The reduction is commonly accompanied by the redistribution of iron within a horizon and the transfer of iron, either from upper horizons to lower ones or completely out of the profile. Mottles, which are in some horizons, indicate the segregation of iron.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

Ablation till. Loose, permeable till deposited during the final downwasting of glacial ice. Lenses of crudely sorted sand and gravel are common.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	more than 12

Basal till. Compact glacial till deposited beneath the ice.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation-exchange capacity.

Bedding planes. Fine stratifications, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediments.

Bedding system. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on the contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chiseling. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard compacted layers to a depth below normal plow depth.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15 to 38 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobbleatone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils are somewhat similar in all areas.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Conservation tillage. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or resting grazing land for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature, for example, fire, that exposes the surface.

Esker (geology). A narrow, winding ridge of stratified gravelly and sandy drift deposited by a stream flowing in a tunnel beneath a glacier.

Excess fines (in tables). Excess silt and clay in the soil. The soil is not a source of gravel or sand for construction purposes.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist, 6 to 15 inches (15 to 38 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Glacial drift (geology). Pulverized and other rock material transported by glacial ice and then deposited. Also the sorted and unsorted material deposited by streams flowing from glaciers.

Glacial outwash (geology). Gravel, sand, and silt, commonly stratified, deposited by glacial meltwater.

Glacial till (geology). Unsorted, nonstratified glacial drift consisting of clay, silt, sand, and boulders transported and deposited by glacial ice.

Glaciofluvial deposits (geology). Material moved by glaciers and subsequently sorted and deposited by streams flowing from the melting ice. The deposits are stratified and occur as kames, eskers, deltas, and outwash plains.

Glaciolacustrine deposits. Material ranging from fine clay to sand derived from glaciers and deposited in glacial lakes mainly by glacial meltwater. Many deposits are interbedded or laminated.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. The major horizons are as follows:

O horizon.—An organic layer of fresh and decaying plant residue.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, any plowed or disturbed surface layer.

E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.

B horizon.—The mineral horizon below an O, A, or E horizon. The B horizon is in part a layer of transition from the overlying horizon to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) granular, prismatic, or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.

Cr horizon.—Soft, consolidated bedrock beneath the soil.

R layer.—Hard, consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation

application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Kame (geology). An irregular, short ridge or hill of stratified glacial drift.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Moraine (geology). An accumulation of earth, stones, and other debris deposited by a glacier. Some types are terminal, lateral, medial, and ground.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Outwash plain. A landform of mainly sandy or coarse textured material of glaciofluvial origin. An outwash plain is commonly smooth; where pitted, it is generally low in relief.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Poor filter (in tables). Because of rapid permeability, the soil may not adequately filter effluent from a waste disposal system.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Root zone. The part of the soil that can be penetrated by plant roots.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the substratum. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff

Shrink-swell. The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces

on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.6 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stripcropping. Growing crops in a systematic arrangement of strips or bands which provide vegetative barriers to soil blowing and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grain* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from soil blowing and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Breaking up a compact subsoil by pulling a special chisel through the soil.

Substratum. The part of the soil below the solum.

Subsurface layer. Any surface soil horizon (A, E, AB, or EB) below the surface layer.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from about 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface soil. The A, E, AB, and EB horizons. It includes all subdivisions of these horizons.

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terminal moraine. A belt of thick glacial drift that generally marks the termination of important glacial advances.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Varve. A sedimentary layer of a lamina or sequence of laminae deposited in a body of still water within a year. Specifically, a thin pair of graded glaciolacustrine layers seasonally deposited, usually by meltwater streams, in a glacial lake or other body of still water in front of a glacier.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

(Recorded in the period 1951-74 at Brookville, Indiana)

Month	Temperature						Precipitation				
	Average daily maximum	Average daily minimum	Average	2 years in 10 will have-- Maximum temperature higher than--	2 years in 10 will have-- Minimum temperature lower than--	Average number of growing degree days*	Average	2 years in 10 will have-- Less than--	2 years in 10 will have-- More than--	Average number of days with 0.10 inch or more	Average snowfall
	°F	°F	°F	°F	°F	Units	In	In	In		In
January	38.3	17.8	28.1	66	-12	17	2.83	1.35	4.09	5	5.1
February	43.1	21.1	31.6	70	-3	19	2.73	1.69	3.67	6	3.7
March	50.9	27.2	39.1	78	9	75	3.49	1.78	4.98	7	3.1
April	63.5	37.6	50.6	85	19	326	3.93	2.02	5.60	8	.2
May	73.9	47.1	60.6	92	28	639	4.50	2.34	6.39	8	.0
June	82.8	57.2	70.0	95	40	900	3.91	2.25	5.38	6	.0
July	85.9	61.1	73.5	96	47	1,039	4.79	2.90	6.48	7	.0
August	84.7	59.0	71.9	97	46	989	3.29	1.45	4.85	6	.0
September	79.7	51.0	65.4	98	33	762	2.47	.91	3.76	5	.0
October	69.8	39.7	54.7	89	22	456	2.08	.66	3.24	5	.0
November	53.4	30.0	41.7	80	6	113	2.71	1.40	3.84	6	2.2
December	41.3	21.7	31.5	69	-6	59	2.73	1.13	4.08	6	3.0
Yearly:											
Average	63.9	39.2	51.6	---	---	---	---	---	---	---	---
Extreme	---	---	---	101	-14	---	---	---	---	---	---
Total	---	---	---	---	---	5,394	39.46	36.60	43.08	75	17.3

* A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (40 degrees F).

TABLE 2.--FREEZE DATES IN SPRING AND FALL

(Recorded in the period 1951-74 at Brookville, Indiana)

Probability	Temperature		
	24° F or lower	28° F or lower	32° F or lower
Last freezing temperature in spring:			
1 year in 10 later than--	Apr. 18	May 6	May 16
2 years in 10 later than--	Apr. 14	May 1	May 11
5 years in 10 later than--	Apr. 6	Apr. 22	May 1
First freezing temperature in fall:			
1 year in 10 earlier than--	Oct. 16	Oct. 11	Sept. 29
2 years in 10 earlier than--	Oct. 20	Oct. 15	Oct. 2
5 years in 10 earlier than--	Oct. 29	Oct. 22	Oct. 9

TABLE 3.--GROWING SEASON

(Recorded in the period 1951-74 at Brookville, Indiana)

Probability	Daily minimum temperature during growing season		
	Higher than 24° F	Higher than 28° F	Higher than 32° F
	Days	Days	Days
9 years in 10	190	166	145
8 years in 10	195	172	150
5 years in 10	205	182	160
2 years in 10	214	192	170
1 year in 10	219	198	175

TABLE 4.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AlA	Alvin sandy loam, 0 to 2 percent slopes	1,054	0.4
AlB	Alvin sandy loam, 2 to 6 percent slopes	560	0.2
AvA	Avonburg silt loam, 0 to 2 percent slopes	13,034	5.2
BnF	Bonnell loam, 25 to 50 percent slopes	4,271	1.7
BoC2	Bonnell silt loam, 6 to 12 percent slopes, eroded	1,567	0.6
BoD2	Bonnell silt loam, 12 to 18 percent slopes, eroded	8,312	3.3
BoE2	Bonnell silt loam, 18 to 25 percent slopes, eroded	9,780	3.9
BpD3	Bonnell clay loam, 12 to 18 percent slopes, severely eroded	11,739	4.7
BrC3	Bonnell silty clay loam, 6 to 12 percent slopes, severely eroded	853	0.3
CbC2	Carmel silt loam, 6 to 12 percent slopes, eroded	3,475	1.4
CkB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded	8,156	3.3
CkC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded	6,125	2.5
CkC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded	14,985	6.0
Cm	Cobbsfork silt loam	6,531	2.6
CoG	Corydon silty clay loam, 18 to 50 percent slopes	862	0.4
Cy	Cyclone silt loam	8,037	3.2
Db	Dearborn loam, frequently flooded	3,945	1.6
EbE2	Eden flaggy silty clay, 15 to 25 percent slopes, eroded	9,010	3.6
EdG	Eden very flaggy silty clay, 25 to 60 percent slopes, stony	25,762	10.3
EeD2	Edenton silt loam, 12 to 18 percent slopes, eroded	2,303	0.9
ElA	Eldean loam, 0 to 2 percent slopes	1,006	0.4
ElB	Eldean loam, 2 to 6 percent slopes	831	0.3
FcB	Fincastle silt loam, 1 to 3 percent slopes	14,198	5.7
FfA	Fincastle-Reesville silt loams, 0 to 1 percent slopes	5,711	2.3
FxC3	Fox complex, 6 to 15 percent slopes, severely eroded	315	0.1
Gd	Gessie loam, sandy substratum, rarely flooded	988	0.4
Ge	Gessie loam, sandy substratum, occasionally flooded	5,267	2.1
HeG	Hennepin loam, 25 to 60 percent slopes	3,877	1.6
Ht	Holton silt loam, occasionally flooded	1,712	0.7
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded	5,582	2.2
MmC2	Miami silt loam, 6 to 12 percent slopes, eroded	1,828	0.7
MmD2	Miami silt loam, 12 to 18 percent slopes, eroded	1,953	0.8
MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded	10,119	4.1
MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded	1,894	0.8
Mr	Milford silty clay loam	288	0.1
Mt	Moundhaven sandy loam, rarely flooded	476	0.2
Mx	Moundhaven sandy loam, occasionally flooded	2,235	0.9
OcA	Ockley loam, 0 to 2 percent slopes	1,544	0.6
OcB2	Ockley loam, 2 to 6 percent slopes, eroded	424	0.2
Og	Oldenburg silt loam, occasionally flooded	1,894	0.8
Pg	Pits, gravel	178	0.1
Pb	Pits, quarries	83	*
PrC	Princeton fine sandy loam, 4 to 12 percent slopes	764	0.3
RkF	Rodman gravelly coarse sandy loam, 35 to 60 percent slopes	828	0.3
Rm	Ross silt loam, rarely flooded	603	0.2
RsA	Rossmoyne silt loam, 0 to 2 percent slopes	982	0.4
RsB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded	11,355	4.5
RuB2	Russell silt loam, 1 to 6 percent slopes, eroded	6,555	2.6
RvA	Russell silt loam, bedrock substratum, 0 to 2 percent slopes	269	0.1
RvB	Russell silt loam, bedrock substratum, 2 to 6 percent slopes	278	0.1
SdB	Sidell silt loam, 1 to 4 percent slopes	261	0.1
UnB	Uniontown silt loam, moderately wet, 2 to 8 percent slopes	359	0.2
UnD2	Uniontown silt loam, 15 to 25 percent slopes, eroded	282	0.1
WeB2	Weisburg silt loam, 2 to 6 percent slopes, eroded	555	0.2
WmB	Williamstown silt loam, 1 to 4 percent slopes	745	0.3
Wn	Wirt loam, occasionally flooded	2,124	0.8
WoB	Woolper silty clay loam, 1 to 6 percent slopes	757	0.3
WrB	Wynn silt loam, 1 to 6 percent slopes	892	0.4
WrC2	Wynn silt loam, 6 to 12 percent slopes, eroded	1,067	0.4
WyC3	Wynn silty clay loam, 6 to 12 percent slopes, severely eroded	1,289	0.5
XnA	Xenia silt loam, 0 to 2 percent slopes	4,417	1.8
XnB2	Xenia silt loam, 2 to 6 percent slopes, eroded	8,790	3.5
	Water areas more than 40 acres in size	3,648	1.5
	Water areas less than 40 acres in size	592	0.2
	Total	250,176	100.0

* Less than 0.1 percent.

TABLE 5.--PRIME FARMLAND

(Only the soils considered prime farmland are listed. Urban or built-up areas of the soils listed are not considered prime farmland. If a soil is prime farmland only under certain conditions, the conditions are specified in parentheses after the soil name)

Map symbol	Soil name
AlA	Alvin sandy loam, 0 to 2 percent slopes
AlB	Alvin sandy loam, 2 to 6 percent slopes
AvA	Avonburg silt loam, 0 to 2 percent slopes (where drained)
CkB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded
Cb	Cobbsfork silt loam (where drained)
Cy	Cyclone silt loam (where drained)
ElA	Eldean loam, 0 to 2 percent slopes
ElB	Eldean loam, 2 to 6 percent slopes
FcB	Fincastle silt loam, 1 to 3 percent slopes (where drained)
FfA	Fincastle-Reesville silt loams, 0 to 1 percent slopes (where drained)
Gd	Gessie loam, sandy substratum, rarely flooded
Ge	Gessie loam, sandy substratum, occasionally flooded
Ht	Holton silt loam, occasionally flooded (where drained)
MmB2	Miami silt loam, 2 to 6 percent slopes, eroded
Mr	Milford silty clay loam (where drained)
OcA	Ockley loam, 0 to 2 percent slopes
OcB2	Ockley loam, 2 to 6 percent slopes, eroded
Og	Oldenburg silt loam, occasionally flooded
Rm	Ross silt loam, rarely flooded
RsA	Rossmoyne silt loam, 0 to 2 percent slopes
RsB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded
RuB2	Russell silt loam, 1 to 6 percent slopes, eroded
RvA	Russell silt loam, bedrock substratum, 0 to 2 percent slopes
RvB	Russell silt loam, bedrock substratum, 2 to 6 percent slopes
SdB	Sidell silt loam, 1 to 4 percent slopes
UaB	Uniontown silt loam, moderately wet, 2 to 8 percent slopes
WeB2	Weisburg silt loam, 2 to 6 percent slopes, eroded
WmB	Williamstown silt loam, 1 to 4 percent slopes
Wn	Wirt loam, occasionally flooded
WoB	Woolper silty clay loam, 1 to 6 percent slopes
WrB	Wynn silt loam, 1 to 6 percent slopes
XnA	Xenia silt loam, 0 to 2 percent slopes
XnB2	Xenia silt loam, 2 to 6 percent slopes, eroded

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE

(Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil)

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue	Tobacco
		Bu	Bu	Bu	Tons	AUM*	Lbs
AlA---- Alvin	IIs	98	33	48	4.3	8.6	3,000
AlB---- Alvin	IIe	97	33	48	4.3	8.6	3,000
AvA---- Avonburg	IIw	110	38	43	4.1	7.8	2,300
BnF---- Bonnell	VIIe	---	---	---	---	---	---
BoC2---- Bonnell	IIIe	90	27	32	3.4	7.0	2,300
BoD2---- Bonnell	IVe	80	---	28	2.7	5.4	2,200
BoE2---- Bonnell	VIe	---	---	---	4.0	8.0	---
BpD3---- Bonnell	VIe	---	---	---	2.5	5.0	---
BrC3---- Bonnell	IVe	85	25	30	3.3	6.6	2,150
CbC2---- Carmel	IIIe	90	28	36	2.9	5.8	---
CkB2---- Cincinnati	IIe	105	30	45	4.2	8.4	3,200
CkC2---- Cincinnati	IIIe	100	30	40	4.0	8.0	3,000
CkC3---- Cincinnati	IVe	90	20	35	3.7	7.4	2,700
Cm---- Cobbsfork	IIIw	110	37	39	4.4	8.8	1,800
CoG---- Corydon	VIIe	---	---	---	0.1	0.2	---
Cy---- Cyclone	IIw	155	54	55	5.1	10.2	---
Db---- Dearborn	IIIs	90	38	40	3.0	6.0	2,550
EbE2---- Eden	VIe	---	---	---	2.7	5.4	---
EdG---- Eden	VIIe	---	---	---	---	---	---

See footnotes at end of table.

TABLE 6.—LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE—Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue	Tobacco
		Bu	Bu	Bu	Tons	AUM*	Lbs
EeD2—Edenton	IVe	80	24	34	3.5	7.0	---
ElA—Eldean	IIs	110	35	42	4.5	9.0	2,600
ElB—Eldean	IIe	100	35	40	4.5	9.0	2,600
FcB—Fincastle	IIe	130	46	52	4.3	8.6	2,300
FfA—Fincastle-Reesville	IIw	140	50	52	4.6	9.2	---
FxC3—Fox	IVe	77	20	30	4.0	8.0	---
Gd—Gessie	I	125	42	50	3.5	7.0	2,700
Ge—Gessie	IIw	110	38	40	3.7	7.4	2,700
HeG—Hennepin	VIIe	---	---	---	---	3.0	---
Ht—Holton	IIIw	75	26	32	3.0	6.4	---
MmB2—Miami	IIe	105	37	47	3.4	6.8	2,850
MmC2—Miami	IIIe	95	33	43	3.1	6.2	---
MmD2—Miami	IVe	80	28	36	2.6	5.2	---
MoC3—Miami	IVe	90	32	40	3.0	6.0	---
MoD3—Miami	VIe	---	---	---	2.5	5.0	---
Mr—Milford	IIw	131	48	56	5.2	10.4	---
Mt—Moundhaven	IIIs	60	21	27	2.0	4.0	2,300
Mx—Moundhaven	IIIw	55	19	25	1.8	3.6	2,300
OcA—Ockley	I	110	38	44	3.6	7.2	2,900
OcB2—Ockley	IIe	105	37	42	3.4	6.8	2,900

See footnotes at end of table.

TABLE 6.—LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE—Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue	Tobacco
		Bu	Bu	Bu	Tons	AUM*	Lbs
Og—Oldenburg	IIw	105	37	42	3.5	7.0	---
Pg**, Ph**. Pits							
PrC—Princeton	IIIe	90	32	40	3.0	6.0	---
RkF—Rodman	VIIs	---	---	---	---	1.0	---
Rm—Ross	I	140	46	56	5.5	9.8	2,700
RsA—Rossmoyne	IIw	110	36	44	4.5	9.0	3,000
RsB2—Rossmoyne	IIe	100	35	40	4.0	8.0	2,900
RuB2—Russell	IIe	120	42	48	4.0	8.0	2,950
RvA—Russell	I	110	40	48	4.3	8.2	2,900
RvB—Russell	IIe	110	40	48	4.3	8.2	2,900
SdB—Sidell	IIe	130	46	52	4.3	8.6	---
UaB—Uniontown	IIe	125	44	50	4.1	8.2	2,800
UnD2—Uniontown	IVe	65	25	30	4.0	8.0	2,300
WeB2—Weisburg	IIe	105	30	45	4.5	9.0	2,750
WmB—Williamstown	IIe	115	43	46	4.1	7.8	3,800
Wn—Wirt	IIw	95	32	42	4.0	7.4	2,650
WoB—Woolper	IIe	115	40	38	4.0	8.0	2,900
WrB—Wynn	IIe	95	33	38	3.8	7.6	2,800
WrC2—Wynn	IIIe	75	26	30	3.6	7.2	---
WyC3—Wynn	IVe	50	18	20	3.0	6.0	---

See footnotes at end of table.

TABLE 6.--LAND CAPABILITY CLASSES AND YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Land capability	Corn	Soybeans	Winter wheat	Orchardgrass-alfalfa hay	Tall fescue	Tobacco
		Bu	Bu	Bu	Tons	AUM*	Lbs
XnA---------- Xenia	I	120	42	48	4.0	8.0	2,850
XnB2---------- Xenia	IIe	115	40	46	3.8	7.6	2,800

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--CAPABILITY CLASSES AND SUBCLASSES

(Miscellaneous areas are excluded. Absence of an entry indicates no acreage)

Class	Total acreage	Major management concerns (Subclass)			
		Erosion (e)	Wetness (w)	Soil problem (s)	Climate (c)
		Acres	Acres	Acres	Acres
I	7,821	---	---	---	---
II	99,695	60,298	37,337	2,060	---
III	29,725	14,826	8,243	6,656	---
IV	40,411	40,411	---	---	---
V	---	---	---	---	---
VI	32,423	32,423	---	---	---
VII	35,600	34,772	---	828	---
VIII	---	---	---	---	---

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY

(Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available)

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
AlA, AlB Alvin	4A	Slight	Slight	Slight	Slight	White oak	80	62	Green ash, black walnut, yellow-poplar, white oak, eastern white pine, American sycamore, sugar maple.
						Northern red oak	80	62	
						Black walnut	---	---	
						Yellow-poplar	90	90	
AvA Avonburg	4D	Slight	Slight	Moderate	Moderate	White oak	70	52	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
						Northern red oak	75	57	
						Pin oak	85	67	
						Yellow-poplar	85	81	
						Sweetgum	80	79	
BnF Bonnell	4R	Severe	Severe	Slight	Slight	Northern red oak	76	58	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine.
						Yellow-poplar	90	90	
						Shortleaf pine	80	130	
						Virginia pine	80	122	
BoC2 Bonnell	4C	Slight	Moderate	Slight	Slight	Northern red oak	76	58	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine.
						Yellow-poplar	90	90	
						Shortleaf pine	80	130	
						Virginia pine	80	122	
BoD2, BoE2 Bonnell	4R	Moderate	Severe	Slight	Slight	Northern red oak	76	58	Yellow-poplar, eastern white pine, shortleaf pine, Virginia pine.
						Yellow-poplar	90	90	
						Shortleaf pine	80	130	
						Virginia pine	80	122	
BpD3 Bonnell	3R	Moderate	Severe	Moderate	Slight	Northern red oak	66	48	Virginia pine, shortleaf pine.
						Shortleaf pine	70	110	
						Virginia pine	70	109	
BrC3 Bonnell	3C	Slight	Moderate	Moderate	Slight	Northern red oak	66	48	Virginia pine, shortleaf pine.
						Shortleaf pine	70	110	
						Virginia pine	70	109	
CbC2 Carmel	5C	Slight	Slight	Severe	Severe	Northern red oak	86	68	Eastern white pine, yellow-poplar, black walnut, white ash, red pine.
						Yellow-poplar	98	104	
						Virginia pine	---	---	
						Shortleaf pine	---	---	
						Eastern white pine	---	---	
						Sweetgum	---	---	

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
CkB2, CkC2, CkC3---------- Cincinnati	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak---------- Black walnut--------- Black cherry--------- Sugar maple--------- White ash---------- Yellow-poplar--------	80 --- --- --- --- --- ---	62 --- --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, northern red oak, white oak.
Cm---------- Cobbsfork	6W	Slight	Severe	Moderate	Moderate	Pin oak---------- Yellow-poplar------- American beech------ Red maple---------- Sweetgum----------	100 --- --- --- ---	82 --- --- --- ---	American sycamore, eastern cottonwood, green ash, pin oak, red maple, silver maple, swamp white oak, sweetgum.
CoG---------- Corydon	4R	Moderate	Moderate	Moderate	Moderate	Northern red oak---- White oak---------- Yellow-poplar--------	70 70 85	52 52 81	Eastern white pine, red pine, Virginia pine, yellow-poplar, black walnut.
Cy---------- Cyclone	5W	Slight	Severe	Severe	Severe	Pin oak---------- White oak---------- Sweetgum----------	90 75 90	72 57 106	Eastern white pine, baldcypress, Norway spruce, red maple, white ash, sweetgum.
Db---------- Dearborn	6A	Slight	Slight	Slight	Slight	Yellow-poplar------- Sweetgum---------- White ash---------- Green ash---------- White oak---------- Red maple---------- Hickory----------	90 --- --- --- --- --- ---	90 --- --- --- --- --- ---	Black walnut, eastern cottonwood, white oak, yellow-poplar, white ash, eastern white pine.
EbE2---------- Eden	4R	Slight	Moderate	Moderate	Moderate	Black oak---------- White oak---------- White ash---------- Scarlet oak--------- Black walnut--------- Eastern redcedar----	68 61 60 68 74 42	50 44 51 50 --- 47	Northern red oak, white oak, white ash, eastern white pine.
EdG---------- Eden	4R	Moderate	Severe	Moderate	Moderate	Black oak---------- White oak---------- White ash---------- Scarlet oak--------- Black walnut--------- Eastern redcedar----	68 61 60 68 74 42	50 44 51 50 --- 47	Northern red oak, white oak, white ash, eastern white pine.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
EeD2---------- Edenton	4R	Moderate	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Eastern white pine--	70 80 80	52 71 155	Eastern white pine, yellow-poplar, Virginia pine.
ElA, ElB-------- Eldean	4A	Slight	Slight	Slight	Slight	Northern red oak---- Black oak---------- White oak---------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash---------- Yellow-poplar-------	80 80 80 --- --- --- --- ---	62 62 62 --- --- --- --- ---	Eastern white pine, black walnut, yellow-poplar, white ash, red pine, white oak.
FcB---------- Fincastle	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak---------- Pin oak---------- Yellow-poplar------- Sweetgum----------	75 75 85 85 80	57 57 67 81 79	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
FfA**: Fincastle------	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak---------- Pin oak---------- Yellow-poplar------- Sweetgum----------	75 75 85 85 80	57 57 67 81 79	Eastern white pine, baldcypress, white ash, red maple, yellow-poplar, American sycamore.
Reesville------	4W	Slight	Moderate	Slight	Slight	Northern red oak---- Yellow-poplar------- Sugar maple--------- Green ash---------- Swamp white oak----- Black cherry-------- Red maple---------- Pin oak---------- Eastern cottonwood--	76 86 90 --- --- --- --- --- ---	58 82 48 --- --- --- --- --- ---	Red maple, silver maple, pin oak, sweetgum, red pine, swamp white oak, baldcypress, green ash, eastern cottonwood,
FxC3**: Fox gravelly sandy clay loam----------	4A	Slight	Slight	Slight	Slight	Northern red oak---- White oak---------- Black walnut-------- Black cherry-------- Sugar maple--------- White ash---------- Yellow-poplar-------	80 --- --- --- --- --- ---	62 --- --- --- --- --- ---	Black walnut, white oak, yellow-poplar, northern red oak, white ash, eastern white pine, red pine. American sycamore.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY—Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
FxC3**: Fox loam	4A	Slight	Slight	Slight	Slight	Northern red oak White oak Sugar maple	80 --- ---	62 --- ---	Yellow-poplar, white ash, eastern white pine, red pine.
Gd, Ge Gessie	8A	Slight	Slight	Slight	Slight	Yellow-poplar	100	107	Black walnut, yellow-poplar, eastern white pine, white ash.
HeG Hennepin	5R	Severe	Severe	Slight	Slight	Northern red oak White oak	85 ---	67 ---	Northern red oak, white oak, green ash, black walnut, eastern white pine, red pine, eastern redcedar.
Ht Holton	5A	Slight	Slight	Slight	Slight	Pin oak Northern red oak Yellow-poplar Sugar maple White oak Black walnut Black cherry White ash	85 80 90 80 --- --- --- ---	67 62 90 42 --- --- --- ---	Eastern white pine, yellow-poplar, black walnut, red pine, white ash, white oak.
MmB2, MmC2, MmD2, MoC3, MoD3 Miami	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.
Mt, Mx Moundhaven	4S	Slight	Slight	Moderate	Severe	Northern red oak White oak Yellow-poplar	78 --- ---	60 --- ---	Black walnut, black oak, yellow-poplar, red pine.
OcA, OcB2 Ockley	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 98 76	72 72 104 70	Eastern white pine, red pine, white ash, yellow-poplar, black walnut.

See footnotes at end of table.

TABLE 6.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
Og Oldenburg	5A	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar White oak	90 94 ---	72 97 ---	Eastern white pine, white oak, yellow-poplar, white ash.
PrC Princeton	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.
RkF Rodman	4R	Severe	Severe	Severe	Slight	Northern red oak White oak Red pine Eastern white pine	70 70 75 85	52 52 115 155	Eastern white pine, red pine, jack pine.
Rm Ross	5A	Slight	Slight	Slight	Slight	Northern red oak Yellow-poplar Sugar maple White oak Black walnut Black cherry White ash	86 96 85 --- --- --- ---	68 100 45 --- --- --- ---	Eastern white pine, black walnut, white ash, yellow-poplar.
RsA, RsB2 Rossmoyne	3D	Slight	Slight	Moderate	Moderate	White oak White ash Northern red oak Sugar maple Slippery elm American beech American sycamore	61 --- 80 --- --- --- ---	44 --- 62 --- --- --- ---	White ash, Virginia pine, yellow-poplar, eastern white pine, black oak.
RuB2 Russell	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 96 76	72 72 100 70	Eastern white pine, white ash, yellow-poplar, black walnut, white oak, northern red oak, green ash, black cherry.
RvA, RvB Russell	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar Sweetgum	90 90 96 76	72 72 100 70	Eastern white pine, red pine, white ash, black walnut.
UaB Uniontown	6A	Slight	Slight	Slight	Slight	Yellow-poplar Sweetgum Black walnut Cherrybark oak Hackberry Pin oak Red maple	89 80 --- --- --- --- ---	88 79 --- --- --- --- ---	Black walnut, yellow-poplar, white ash, eastern white pine, shortleaf pine, loblolly pine, cherrybark oak, sweetgum, eastern cottonwood.

See footnotes at end of table.

TABLE 8.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns				Potential productivity			Trees to plant
		Erosion hazard	Equipment limitation	Seedling mortality	Windthrow hazard	Common trees	Site index	Volume*	
UnD2 Uniontown	6R	Moderate	Moderate	Slight	Slight	Yellow-poplar Northern red oak Black oak Shumard oak Sweetgum Hickory White oak	89 83 82 83 79 ---<br---	88 65 64 65 77 ---<br---	Yellow-poplar, black walnut, white ash, white oak, northern red oak, eastern white pine, sweetgum.
WeB2 Weisburg	4A	Slight	Slight	Slight	Slight	Northern red oak	80	62	Eastern white pine, black walnut, yellow-poplar.
WmB Williamstown	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar White ash	85 100 85	67 107 111	Black walnut, white oak, yellow-poplar.
Wn Wirt	7A	Slight	Slight	Slight	Slight	Yellow-poplar	95	98	Eastern white pine, black walnut, yellow-poplar.
WoB Woolper	4C	Slight	Moderate	Moderate	Slight	Black oak Chinkapin oak White ash Hickory Sugar maple White oak Yellow buckeye Black walnut	75 71 ---<br---<br---<br---<br---<br---	57 53 ---<br---<br---<br---<br---<br---	Yellow-poplar, white ash, white oak, northern red oak, eastern white pine.
WrB, WrC2 Wynn	5A	Slight	Slight	Slight	Slight	White oak Northern red oak Yellow-poplar White ash Black walnut Black cherry Sugar maple	85 85 95 ---<br---<br---<br---	67 67 98 ---<br---<br---<br---	Eastern white pine, yellow-poplar, black walnut, white ash, red pine, white oak.
WyC3 Wynn	4C	Slight	Moderate	Moderate	Moderate	White oak White ash Black cherry Red maple Slippery elm	75<br---<br---<br---<br---	57<br---<br---<br---<br---	Austrian pine, yellow-poplar, red maple, green ash, pin oak.
XnA, XnB2 Xenia	5A	Slight	Slight	Slight	Slight	White oak Yellow-poplar Sweetgum	90 98 76	72 104 70	Eastern white pine, red pine, black walnut, yellow-poplar, white ash.

* Volume is the yield in cubic feet per acre per year calculated at the age of culmination of mean annual increment for fully stocked natural stands.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS

(The symbol < means less than; > means more than. Absence of an entry indicates that trees generally do not grow to the given height on that soil)

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
AlA, AlB---------- Alvin	---	Amur privet, Washington hawthorn, Amur honeysuckle, American cranberrybush, Tatarian honeysuckle.	Austrian pine, northern white-cedar, osageorange, eastern redcedar.	Eastern white pine, red pine, Norway spruce.	---
AvA---------- Avonburg	---	Arrowwood, eastern redcedar, Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
BnF, BoC2, BoD2, BoE2, BpD3, BrC3- Bonnell	---	Eastern redcedar, Washington hawthorn, Amur honeysuckle, Amur privet, American cranberrybush, arrowwood, Tatarian honeysuckle.	Austrian pine, green ash, osageorange.	Pin oak, eastern white pine.	---
CbC2---------- Carmel	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
CkB2, CkC2, CkC3-- Cincinnati	---	Eastern redcedar, Washington hawthorn, Tatarian honeysuckle, Amur privet, Amur honeysuckle, arrowwood, American cranberrybush.	Green ash, Austrian pine, osageorange.	Pin oak, eastern white pine.	---

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
Cm---------- Cobbsfork	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, northern white-cedar, blue spruce, white fir, Washington hawthorn, Norway spruce.	Eastern white pine	Pin oak.
CoG. Corydon					
Cy---------- Cyclone	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, Norway spruce, Austrian pine, blue spruce, white fir, Washington hawthorn.	Eastern white pine	Pin oak.
Db---------- Dearborn	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
EbE2, EdG--------- Eden	---	American cranberrybush, Amur honeysuckle, Tatarian honeysuckle, Amur privet, arrowwood, Washington hawthorn, eastern redcedar.	Hackberry, osageorange, Austrian pine.	Pin oak, eastern white pine.	---
EeD2---------- Edenton	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
ElA, ElB---------- Eldean	Siberian peashrub	Autumn-olive, eastern redcedar, radiant crabapple, Tatarian honeysuckle, Washington hawthorn, Amur honeysuckle, lilac.	Austrian pine, eastern white pine, jack pine, red pine.	---	---

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
FcB---------- Fincastle	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
PfA*: Fincastle--------	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
Reesville--------	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
PxC3*: Fox gravelly sandy clay loam-	Siberian peashrub	Tatarian honeysuckle, lilac, Amur honeysuckle, autumn-olive, Washington hawthorn, radiant crabapple, eastern redcedar.	Jack pine, red pine, Austrian pine, eastern white pine.	---	---
Fox loam---------	Siberian peashrub	Autumn-olive, Amur honeysuckle, eastern redcedar, radiant crabapple, Washington hawthorn, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
Gd, Ge---------- Gessie	---	Siberian peashrub, Tatarian honeysuckle.	Green ash, northern white-cedar, Washington hawthorn, osageorange, white spruce, nannyberry viburnum, eastern redcedar.	---	---

See footnote at end of table.

TABLE 9.—WINDBREAKS AND ENVIRONMENTAL PLANTINGS—Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
ReG---------- Hennepin	Siberian peashrub, Tatarian honeysuckle.	Eastern redcedar, osageorange, Russian-olive, jack pine, Washington hawthorn, silky dogwood, Amur privet, American cranberrybush.	Honeylocust, northern catalpa.	---	---
Ht---------- Holton	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Austrian pine, Washington hawthorn.	Norway spruce-----	Eastern white pine, pin oak.
MaB2, MaC2, MaD2, MoC3, MoD3------- Miami	---	Amur honeysuckle, Amur privet, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Mr---------- Milford	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, white fir, blue spruce, northern white-cedar, Austrian pine, Norway spruce.	Eastern white pine	Pin oak.
Mt, Mx---------- Houndhaven	---	Tatarian honeysuckle, Siberian peashrub.	Green ash, Washington hawthorn, northern white-cedar, nannyberry viburnum, osageorange, white spruce, eastern redcedar.	---	---
OcA, OcB2--------- Ockley	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Og---------- Oldenburg	---	Amur honeysuckle, silky dogwood, Amur privet, American cranberrybush.	Northern white-cedar, white fir, Austrian pine, Washington hawthorn, blue spruce.	Norway spruce-----	Eastern white pine, pin oak.
Pg*, Ph*. Pits					

See footnote at end of table.

TABLE 9.--WINDBREAKS AND ENVIRONMENTAL PLANTINGS--Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
PrC---------- Princeton	---	Washington hawthorn, Amur honeysuckle, American cranberrybush, Amur privet, Tatarian honeysuckle.	Eastern redcedar, Austrian pine, osageorange, northern white-cedar.	Eastern white pine, Norway spruce, red pine.	---
RkF. Rodman					
Rm---------- Ross	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, northern white-cedar, blue spruce, white fir, Austrian pine.	Norway spruce----	Pin oak, eastern white pine.
RsA, RsB2---------- Rossmoyne	---	Washington hawthorn, Amur honeysuckle, Amur privet, Tatarian honeysuckle, eastern redcedar, arrowwood, American cranberrybush.	Austrian pine, osageorange, green ash.	Pin oak, eastern white pine.	---
RuB2---------- Russell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
RvA, RvB---------- Russell	---	American cranberrybush, Amur privet, silky dogwood, Amur honeysuckle.	White fir, Washington hawthorn, blue spruce, northern white-cedar.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
SdB---------- Sidell	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
UaB---------- Uniontown	---	American cranberrybush, Amur honeysuckle, Amur privet, silky dogwood.	Northern white-cedar, white fir, Washington hawthorn, blue spruce.	Austrian pine, Norway spruce.	Eastern white pine, pin oak.
UnD2---------- Uniontown	---	Silky dogwood, American cranberrybush, Amur honeysuckle, Amur privet.	Washington hawthorn, blue spruce, northern white-cedar, white fir.	Norway spruce----	Austrian pine, pin oak, eastern white pine.

See footnote at end of table.

TABLE 9.—WINDBREAKS AND ENVIRONMENTAL PLANTINGS—Continued

Soil name and map symbol	Trees having predicted 20-year average height, in feet, of--				
	<8	8-15	16-25	26-35	>35
MeB2---------- Weisburg	---	Eastern redcedar, Washington hawthorn, Amur privet, arrowwood, Amur honeysuckle, Tatarian honeysuckle, American cranberrybush.	Austrian pine, green ash, osageorange.	Eastern white pine, pin oak.	---
WmB---------- Williamstown	---	Amur privet, Amur honeysuckle, American cranberrybush, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.
Wn---------- Wirt	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	Austrian pine, white fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce------	Eastern white pine, pin oak.
WoB---------- Woolper	---	American cranberrybush, Amur honeysuckle, Tatarian honeysuckle, Amur privet, arrowwood, Washington hawthorn, eastern redcedar.	Hackberry, osageorange, Austrian pine.	Pin oak, eastern white pine.	---
WrB, WrC2, WyC3--- Wynn	Siberian peashrub	Eastern redcedar, radiant crabapple, Washington hawthorn, autumn-olive, Amur honeysuckle, lilac, Tatarian honeysuckle.	Eastern white pine, Austrian pine, red pine, jack pine.	---	---
XnA, XnB2---------- Xenia	---	Amur honeysuckle, American cranberrybush, Amur privet, silky dogwood.	White fir, blue spruce, northern white-cedar, Washington hawthorn.	Norway spruce, Austrian pine.	Eastern white pine, pin oak.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.—RECREATIONAL DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AlA—Alvin	Slight	Slight	Slight	Slight	Slight.
AlB—Alvin	Slight	Slight	Moderate: slope.	Slight	Slight.
AvA—Avonburg	Severe: wetness, percs slowly.	Severe: percs slowly.	Severe: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
BnF—Bonnell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
BoC2—Bonnell	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
BoD2, BoE2, BpD3—Bonnell	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
BrC3—Bonnell	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
CbC2—Carmel	Severe: percs slowly.	Severe: percs slowly.	Severe: slope, percs slowly.	Severe: erodes easily.	Moderate: slope.
CkB2—Cincinnati	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
CkC2, CkC3—Cincinnati	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Cm—Cobbsfork	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding.
CoG—Corydon	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, depth to rock.
Cy—Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Dh—Dearborn	Severe: flooding.	Moderate: flooding.	Severe: flooding.	Moderate: flooding.	Severe: flooding.
EbE2—Eden	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: large stones, slope, small stones.	Severe: too clayey.	Severe: large stones, slope.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
EdG Eden	Severe: slope, too clayey.	Severe: slope, too clayey.	Severe: large stones, slope, small stones.	Severe: too clayey, slope.	Severe: large stones, slope.
EeD2 Edenton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
ElA Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: small stones.	Severe: erodes easily.	Moderate: droughty.
ElB Eldean	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones.	Severe: erodes easily.	Moderate: droughty.
FcB Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FfA*: Fincastle	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
Reesville	Severe: wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: wetness.
FxC3*: Fox gravelly sandy clay loam	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: small stones, slope.
Fox loam	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Slight	Moderate: slope, small stones.
Gd Gessie	Severe: flooding.	Slight	Slight	Slight	Slight.
Ge Gessie	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: flooding.
HeG Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ht Holton	Severe: flooding, wetness.	Moderate: wetness.	Severe: wetness.	Moderate: wetness.	Moderate: large stones, wetness, flooding.
MmB2 Miami	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
MmC2 Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MmD2 Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.

See footnote at end of table.

TABLE 10.—RECREATIONAL DEVELOPMENT—Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MoC3—Miami	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
MoD3—Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Mr—Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.
Mt—Moundhaven	Severe: flooding.	Slight	Slight	Slight	Moderate: droughty.
Mx—Moundhaven	Severe: flooding.	Slight	Moderate: flooding.	Slight	Moderate: droughty, flooding.
OcA—Ockley	Slight	Slight	Moderate: small stones.	Slight	Slight.
OcB2—Ockley	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Og—Oldenburg	Severe: flooding.	Moderate: wetness.	Moderate: wetness, flooding.	Slight	Moderate: flooding.
Pg*, Ph*. Pits					
PrC—Princeton	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
RkF—Rodman	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: droughty, slope.
Rm—Ross	Severe: flooding.	Slight	Slight	Slight	Slight.
RsA—Rossmoyne	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
RsB2—Rossmoyne	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
RuB2—Russell	Slight	Slight	Moderate: slope.	Slight	Slight.
RvA—Russell	Slight	Slight	Slight	Slight	Slight.
RvB—Russell	Slight	Slight	Moderate: slope.	Slight	Slight.
SdB—Sidell	Slight	Slight	Moderate: slope.	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
UaB---- Uniontown	Slight----	Slight----	Moderate: slope.	Severe: erodes easily.	Slight.
UnD2---- Uniontown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
WeB2---- Weisburg	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Severe: erodes easily.	Slight.
WmB---- Williamstown	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Moderate: wetness.
Wn---- Wirt	Severe: flooding.	Slight----	Moderate: flooding.	Slight----	Moderate: flooding.
WoB---- Woolper	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly, slope.	Severe: erodes easily.	Slight.
WrB---- Wynn	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, depth to rock, percs slowly.	Slight----	Moderate: depth to rock.
WrC2, WyC3---- Wynn	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: slope, depth to rock.
XnA---- Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: wetness.	Slight.
XnB2---- Xenia	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Moderate: slope, wetness, percs slowly.	Moderate: wetness.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.—WILDLIFE HABITAT

(See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated)

Soil name and map symbol	Potential for habitat elements							Potential as habitat for—		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
AlA, AlB---------- Alvin	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
AvA---------- Avonburg	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
BnF---------- Bonnell	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Very poor.	Good	Very poor.
BoC2---------- Bonnell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BoD2, BoE2, BpD3--- Bonnell	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
BrC3---------- Bonnell	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CbC2---------- Carmel	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
CkB2---------- Cincinnati	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
CkC2, CkC3--------- Cincinnati	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Cm---------- Cobbsfork	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
CoG---------- Coryden	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Cy---------- Cyclone	Fair	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Db---------- Dearborn	Poor	Fair	Fair	Good	Good	Poor	Very poor.	Fair	Good	Very poor.
EbE2---------- Eden	Poor	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
EdG---------- Eden	Very poor.	Poor	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.
EeD2---------- Edenton	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
ElA---------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
ElB---------- Eldean	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
FcB---------- Fincastle	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

TABLE 11.—WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for—		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
PfA*:										
Fincastle	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
Reesville	Fair	Good	Good	Good	Good	Fair	Fair	Good	Good	Fair.
FxC3*:										
Fox gravelly sandy clay loam	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Fox loam	Good	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
Gd, Ge Gessie	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
HeG Hennepin	Very poor.	Poor	Good	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.
Ht Holton	Poor	Fair	Fair	Good	Good	Fair	Fair	Fair	Good	Fair.
MmB2 Miami	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
MmC2 Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MmD2 Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
MoC3 Miami	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
MoD3 Miami	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
Mr Milford	Good	Fair	Fair	Fair	Fair	Good	Good	Fair	Fair	Good.
Mt, Mx Moundhaven	Fair	Fair	Fair	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.
OcA, OcB2 Ockley	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Og Oldenburg	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
Pg*, Ph*. Pits										
PrC Princeton	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
RkF Rodman	Very poor.	Poor	Fair	Poor	Poor	Very poor.	Very poor.	Poor	Poor	Very poor.
Rm Ross	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.

See footnote at end of table.

TABLE 11.--WILDLIFE HABITAT--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--		
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Hardwood trees	Coniferous plants	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife
RsA---- Rossmoyne	Fair	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.
RsB2---- Rossmoyne	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
RuB2, RvA, RvB---- Russell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
SdB---- Sidell	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UaB---- Uniontown	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
UnD2---- Uniontown	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.
WeB2---- Weisburg	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WmB---- Williamstown	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
Wn---- Wirt	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WoB---- Woolper	Good	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WrB---- Wynn	Fair	Good	Good	Good	Good	Poor	Very poor.	Good	Good	Very poor.
WrC2, WyC3---- Wynn	Fair	Good	Good	Good	Good	Very poor.	Very poor.	Good	Good	Very poor.
XnA, XnB2---- Xenia	Good	Good	Good	Good	Good	Poor	Poor	Good	Good	Poor.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--BUILDING SITE DEVELOPMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AlA Alvin	Severe: cutbanks cave.	Slight	Slight	Slight	Moderate: frost action.	Slight.
AlB Alvin	Severe: cutbanks cave.	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
AvA Avonburg	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
BnF Bonnell	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
BoC2 Bonnell	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
BoD2, BoE2, BpD3 Bonnell	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
BrC3 Bonnell	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
CbC2 Carmel	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
CkB2 Cincinnati	Moderate: dense layer, wetness.	Slight	Moderate: wetness.	Moderate: slope.	Severe: low strength, frost action.	Slight.
CkC2, CkC3 Cincinnati	Moderate: dense layer, wetness, slope.	Moderate: slope.	Moderate: wetness, slope.	Severe: slope.	Severe: low strength, frost action.	Moderate: slope.
Cm Cobbsfork	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding, frost action.	Severe: ponding.
CoG Corydon	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, depth to rock.
Cy Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
Db Dearborn	Moderate: large stones, flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.
EbE2, EdG Eden	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: large stones, slope.
EeD2 Edenton	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
ElA Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell.	Severe: low strength.	Moderate: droughty.
ElB Eldean	Severe: cutbanks cave.	Moderate: shrink-swell.	Slight	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: droughty.
FcB Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FfA*: Fincastle	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
Reesville	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: low strength, frost action.	Moderate: wetness.
FxC3*: Fox gravelly sandy clay loam	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Severe. low strength.	Moderate: small stones, slope.
Fox loam	Severe: cutbanks cave.	Moderate: shrink-swell, slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope, small stones.
Gd Gessie	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, frost action.	Slight.
Ge Gessie	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
HeG Hennepin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Ht Holton	Severe: cutbanks cave, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, frost action.	Moderate: large stones, wetness, flooding.
MmB2 Miami	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: slope, shrink-swell.	Moderate: frost action, shrink-swell.	Slight.

See footnote at end of table.

TABLE 12.—BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MmC2---------- Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MmD2---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
MoC3---------- Miami	Moderate: slope, dense layer.	Moderate: slope, shrink-swell.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, frost action, shrink-swell.	Moderate: slope.
MoD3---------- Miami	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mr---------- Milford	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: low strength, ponding, frost action.	Severe: ponding.
Mt---------- Moundhaven	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Moderate: droughty.
Mx---------- Moundhaven	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
OcA---------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, low strength.	Slight.
OcB2---------- Ockley	Severe: cutbanks cave.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell, low strength.	Slight.
Og---------- Oldenburg	Severe: wetness.	Severe: flooding.	Severe: flooding, wetness.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
Pg*, Ph*. Pits						
PrC---------- Princeton	Severe: cutbanks cave.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
RkF---------- Rodman	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
Rm---------- Ross	Moderate: wetness.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, frost action.	Slight.
RsA---------- Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.

See footnote at end of table.

TABLE 12.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
RsB2--- Rossmoyne	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Moderate: wetness.
RuB2--- Russell	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength, frost action.	Slight.
RvA--- Russell	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: frost action.	Slight.
RvB--- Russell	Moderate: wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell, slope.	Severe: frost action.	Slight.
SdB--- Sidell	Moderate: dense layer.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength, frost action.	Slight.
UaB--- Urban land	Moderate: wetness.	Slight---	Moderate: wetness.	Moderate: slope.	Severe: low strength, frost action.	Slight.
UnD2--- Urban land	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope, frost action.	Severe: slope.
WeB2--- Weisburg	Moderate: too clayey.	Slight---	Severe: shrink-swell.	Moderate: slope.	Severe: frost action.	Slight.
WmB--- Williamstown	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Moderate: wetness.
Wn--- Wirt	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.
WoB--- Woolper	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
WrB--- Wynn	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: depth to rock.
WrC2, WyC3--- Wynn	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope, depth to rock.
XnA--- Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: low strength, frost action.	Slight.
XnB2--- Xenia	Severe: wetness.	Moderate: wetness, shrink-swell.	Severe: wetness.	Moderate: wetness, shrink-swell, slope.	Severe: low strength, frost action.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SANITARY FACILITIES

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AlA, AlB Alvin	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Fair: thin layer.
AvA Avonburg	Severe: wetness, percs slowly.	Slight	Severe: wetness.	Severe: wetness.	Poor: wetness.
BnF Bonnell	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BoC2 Bonnell	Severe: percs slowly.	Severe: slope.	Moderate: too clayey.	Moderate: slope.	Fair: too clayey.
BoD2, BoE2, BpD3 Bonnell	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
BrC3 Bonnell	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
CbC2 Carmel	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
CkB2 Cincinnati	Severe: wetness, percs slowly.	Moderate: slope.	Moderate: wetness, too clayey.	Moderate: wetness.	Fair: too clayey, wetness.
CkC2, CkC3 Cincinnati	Severe: wetness, percs slowly.	Severe: slope.	Moderate: wetness, slope, too clayey.	Moderate: wetness, slope.	Fair: too clayey, slope, wetness.
Cm Cobbsfork	Severe: ponding, percs slowly.	Slight	Severe: ponding.	Severe: ponding.	Poor: ponding.
CoG Corydon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Cy Cyclone	Severe: ponding.	Severe: ponding.	Severe: ponding.	Severe: ponding.	Poor: ponding.
Db Dearborn	Severe: flooding.	Severe: flooding.	Severe: flooding, large stones.	Severe: flooding.	Poor: large stones.

TABLE 13.—SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EbE2, EdG Eden	Severe: depth to rock, slope.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, slope.
EeD2 Edenton	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: depth to rock, too clayey, hard to pack.
ElA, ElB Eldean	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
FcB Fincastle	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
FfA*: Fincastle	Severe: wetness, percs slowly.	Severe. wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
Reesville	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Poor: wetness.
FxC3*: Fox gravelly sandy clay loam	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Fox loam	Severe: poor filter.	Severe: seepage, slope.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
Gd Gessie	Moderate: flooding, percs slowly.	Severe: seepage.	Severe: seepage.	Moderate: flooding.	Fair: thin layer.
Ge Gessie	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding, seepage.	Severe: flooding.	Fair: thin layer.
HeG Hennepin	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Ht Holton	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: large stones, wetness.
MmB2 Miami	Severe: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
MmC2 Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
MmD2---------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
MoC3---------- Miami	Severe: percs slowly.	Severe: slope.	Moderate: slope.	Moderate: slope.	Fair: slope.
MoD3---------- Miami	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Mr---------- Milford	Severe: ponding, percs slowly.	Severe: ponding.	Severe: ponding, too clayey.	Severe: ponding.	Poor: too clayey, hard to pack, ponding.
Mt---------- Moundhaven	Severe: poor filter.	Severe: seepage.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy.
Mx---------- Moundhaven	Severe: flooding, poor filter.	Severe: seepage, flooding.	Severe: flooding, seepage, too sandy.	Severe: flooding, seepage.	Poor: seepage, too sandy.
OcA, OcB2---------- Ockley	Moderate: percs slowly.	Severe: seepage.	Severe: seepage.	Slight----------	Poor: small stones.
Og---------- Oldenburg	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Fair: wetness.
Pg*, Ph*. Pits					
PrC---------- Princeton	Moderate: slope.	Severe: seepage, slope.	Severe: seepage.	Moderate: slope.	Fair. slope.
RkF---------- Rodman	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope, too sandy.	Severe: seepage, slope.	Poor. seepage, too sandy, small stones.
Rm---------- Ross	Moderate: flooding, wetness.	Severe: seepage.	Severe: seepage, wetness.	Severe: seepage.	Good.
RsA---------- Rossmoyne	Severe: wetness, percs slowly.	Slight----------	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
RsB2---------- Rossmoyne	Severe: wetness, percs slowly.	Moderate: slope.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
RuB2---------- Russell	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight----------	Fair: too clayey.

See footnote at end of table.

TABLE 13.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RvA Russell	Severe: percs slowly.	Moderate: seepage, depth to rock.	Severe: depth to rock.	Moderate: depth to rock.	Fair: depth to rock, too clayey, thin layer.
RvB Russell	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: depth to rock, too clayey, thin layer.
SdB Sidell	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
UaB Uniontown	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: wetness, too clayey.
UnD2 Uniontown	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
WeB2 Weisburg	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
WmB Williamstown	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Moderate: wetness.	Fair: too clayey, wetness.
Wn Wirt	Severe: flooding.	Severe: seepage, flooding.	Severe: flooding.	Severe: flooding.	Good.
WoB Woolper	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
WrB Wynn	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
WrC2, WyC3 Wynn	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: depth to rock, too clayey, hard to pack.
XnA, XnB2 Xenia	Severe: wetness, percs slowly.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Fair: too clayey, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CONSTRUCTION MATERIALS

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AlA, AlB Alvin	Good	Probable	Improbable: too sandy.	Good.
AvA Avonburg	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
BnF Bonnell	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
BoC2 Bonnell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BoD2, BoE2, BpD3 Bonnell	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
BrC3 Bonnell	Poor. low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CbC2 Carmel	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, too clayey.
CkB2 Cincinnati	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim; small stones.
CkC2, CkC3 Cincinnati	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
Cm Cobbsfork	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CoG Corydon	Poor: depth to rock, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: depth to rock, slope.
Cy Cyclone	Poor: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
Db Dearborn	Fair: large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
EbE2 Eden	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones.
EdG Eden	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey, large stones.

TABLE 14.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EeD2---- Edenton	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
ElA, ElB---- Eldean	Good----	Probable----	Probable----	Poor: small stones, area reclaim.
FcB---- Fincastle	Fair: wetness.	Improbable: excess fines.	Improbable excess fines.	Good.
FfA*: Fincastle----	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Reesville----	Fair: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
FxC3*: Fox gravelly sandy clay loam----	Good----	Probable----	Probable----	Poor: small stones, area reclaim.
Fox loam----	Good----	Probable----	Probable----	Poor: small stones, area reclaim.
Gd, Ge---- Gessie	Good----	Probable----	Improbable: too sandy.	Good.
HeG---- Hennepin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Ht---- Holton	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
MmB2---- Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable. excess fines.	Fair: area reclaim.
MmC2---- Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MmD2---- Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
MoC3---- Miami	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, slope.
MoD3---- Miami	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mr---- Milford	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

See footnote at end of table.

TABLE 14.—CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
Mt, Mx---------- Moundhaven	Good----------	Probable----------	Improbable: too sandy.	Poor: thin layer.
OcA, OcB2---------- Ockley	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
Og---------- Oldenburg	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Pg*, Ph*. Pits				
PrC---------- Princeton	Good----------	Improbable: excess fines.	Improbable: excess fines.	Fair: slope.
RkF---------- Rodman	Poor: slope.	Probable----------	Probable----------	Poor: area reclaim, small stones.
Rm---------- Ross	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
RsA, RsB2---------- Rossmoyne	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim.
RuB2---------- Russell	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
RvA, RvB---------- Russell	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
SdB---------- Sidell	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
UaB---------- Uniontown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
UnD2---------- Uniontown	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
WeB2---------- Weisburg	Poor: shrink-swell, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey, thin layer.
WmB---------- Williamstown	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Good.
Wn---------- Wirt	Good----------	Improbable: excess fines.	Improbable: excess fines.	Good.
WoB---------- Woolper	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
WrB, WrC2, WyC3---------- Wynn	Poor: depth to rock, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
XnA, XnB2---------- Xenia	Fair: wetness.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 15.--WATER MANAGEMENT

(Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation)

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
AlA, AlB Alvin	Severe: seepage.	Severe: piping.	Severe: no water.	Deep to water	Soil blowing	Favorable.
AvA Avonburg	Slight	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness, rooting depth.	Wetness, erodes easily, rooting depth.
BnF, BoC2, BoD2, BoE2, BpD3, BrC3 Bonnell	Severe: slope.	Moderate: hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
CbC2 Carmel	Severe: slope.	Moderate: thin layer, hard to pack.	Severe: no water.	Deep to water	Slope, erodes easily, percs slowly.	Slope, erodes easily, rooting depth.
CkB2 Cincinnati	Moderate: seepage, slope.	Severe: thin layer.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness, percs slowly.	Erodes easily, rooting depth, percs slowly.
CkC2, CkC3 Cincinnati	Severe: slope.	Severe: thin layer.	Severe: no water.	Percs slowly, frost action, slope.	Slope, erodes easily, wetness.	Slope, erodes easily, rooting depth.
Cm Cobbsfork	Slight	Severe: piping, ponding.	Severe: no water.	Ponding, percs slowly, frost action.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, rooting depth.
CoG Corydon	Severe: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock.	Slope, depth to rock.
Cy Cyclone	Moderate: seepage.	Severe: ponding.	Severe: slow refill.	Ponding, frost action	Ponding	Wetness.
Db Dearborn	Moderate: seepage.	Severe: piping, large stones.	Severe: no water.	Deep to water	Large stones, erodes easily.	Large stones, erodes easily, droughty.
EbE2, EdG Eden	Severe: slope.	Severe: hard to pack, large stones.	Severe: no water.	Deep to water	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
EeD2 Edenton	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
ElA, ElB Eldean	Severe: seepage.	Severe: seepage.	Severe: no water.	Deep to water	Erodes easily, too sandy.	Erodes easily, droughty.
FcB Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
FEA*:						
Fincastle	Moderate: seepage.	Severe: wetness.	Severe: slow refill.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
Reesville	Moderate: seepage.	Severe: piping.	Severe: no water.	Frost action	Erodes easily, wetness.	Wetness, erodes easily.
FxC3*:						
Fox gravelly sandy clay loam	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, erodes easily, too sandy.	Slope, erodes easily.
Fox loam	Severe: seepage, slope.	Severe: seepage, piping.	Severe: no water.	Deep to water	Slope, too sandy.	Slope.
Gd, Ge	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Favorable	Favorable.
Gessie						
HeG	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, percs slowly.	Slope, droughty, percs slowly.
Hennepin						
Ht	Moderate: seepage.	Severe: piping, wetness.	Slight	Flooding, large stones, frost action.	Large stones, erodes easily, wetness.	Large stones, wetness, erodes easily.
Holton						
MmB2	Moderate: seepage, slope.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily, rooting depth.
Miami						
MmC2, MmD2, MoC3, MoD3	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily.	Slope, erodes easily, rooting depth.
Miami						
Mr	Slight	Severe: ponding.	Severe: slow refill.	Ponding, frost action.	Erodes easily, ponding.	Wetness, erodes easily.
Milford						
Mt, Mx	Severe: seepage.	Severe: seepage, piping.	Severe: no water.	Deep to water	Too sandy, soil blowing.	Droughty.
Moundhaven						
OcA, OcB2	Severe: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
Ockley						
Og	Moderate: seepage.	Severe: piping.	Moderate: deep to water, slow refill.	Flooding	Erodes easily, wetness.	Erodes easily.
Oldenburg						
Pg*, Ph*.						
Pits						
PrC	Severe: slope, seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Slope, soil blowing.	Slope.
Princeton						

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
RkF---- Rodman	Severe: seepage, slope.	Severe: seepage.	Severe: no water.	Deep to water	Slope, too sandy.	Slope, droughty, rooting depth.
Rm---- Ross	Severe: seepage	Severe: piping.	Severe: no water.	Deep to water	Favorable----	Favorable.
RsA---- Rossmoyne	Moderate: seepage.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action.	Erodes easily, wetness.	Erodes easily, rooting depth.
RsB2---- Rossmoyne	Moderate: seepage, slope.	Moderate: piping, wetness.	Severe: no water.	Percs slowly, frost action, slope.	Erodes easily, wetness.	Erodes easily, rooting depth.
RuB2---- Russell	Moderate: seepage, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
RvA---- Russell	Moderate: seepage, depth to rock.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
RvB---- Russell	Moderate: seepage, depth to rock, slope.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
SdB---- Sidell	Moderate: seepage.	Moderate: thin layer, piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
UaB---- Uniontown	Moderate: seepage, slope.	Severe: piping.	Moderate: deep to water, slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.
UnD2---- Uniontown	Severe: slope.	Severe: piping.	Severe: no water.	Deep to water	Slope, erodes easily, wetness.	Slope, erodes easily.
WeB2---- Weisburg	Moderate: slope.	Moderate: hard to pack, piping.	Severe: no water.	Deep to water	Erodes easily, rooting depth.	Erodes easily, rooting depth.
WmB---- Williamstown	Moderate: seepage.	Severe: thin layer, piping.	Moderate: deep to water.	Frost action--	Erodes easily, wetness.	Erodes easily.
Wn---- Wirt	Moderate: seepage.	Severe: piping.	Severe: no water.	Deep to water	Erodes easily	Erodes easily.
WoB---- Woolper	Moderate: slope.	Severe: hard to pack.	Severe: no water.	Deep to water	Erodes easily, percs slowly.	Erodes easily, percs slowly.
WrB---- Wynn	Moderate: depth to rock, slope.	Severe: thin layer.	Severe: no water.	Deep to water	Depth to rock, erodes easily.	Erodes easily, depth to rock.
WrC2, WyC3---- Wynn	Severe: slope.	Severe: thin layer.	Severe: no water.	Deep to water	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

See footnote at end of table.

TABLE 15.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--			Features affecting--		
	Pond reservoir areas	Embankments, dikes, and levees	Aquifer-fed excavated ponds	Drainage	Terraces and diversions	Grassed waterways
XnA---------- Xenia	Moderate: seepage.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action---	Erodes easily, wetness.	Erodes easily.
XnB2---------- Xenia	Moderate: seepage, slope.	Moderate: thin layer, wetness.	Severe: slow refill.	Frost action, slope.	Erodes easily, wetness.	Erodes easily.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--ENGINEERING INDEX PROPERTIES

(The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated)

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AlA, AlB----------	0-10	Sandy loam--------	SM, ML	A-4, A-2	0	100	100	80-95	30-60	<25	NP-4
Alvin	10-46	Fine sandy loam, loam, sandy clay loam.	SM, SC, CL, ML	A-2, A-4, A-6	0	100	100	90-100	20-80	15-38	NP-13
	46-60	Stratified loamy sand to fine sand.	SM, SP, SP-SM	A-2, A-3	0-5	95-100	90-100	70-95	4-35	<20	NP-4
AvA----------	0-11	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	95-100	75-95	20-30	2-10
Avonburg	11-21	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	75-95	30-45	10-20
	21-75	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0-3	95-100	95-100	90-100	70-95	30-45	10-20
	75-80	Silt loam, loam	CL	A-6, A-7	0-3	95-100	90-100	75-95	60-85	30-45	10-20
BnF----------	0-10	Loam----------	ML, CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	65-90	25-35	4-12
Bonnell	10-48	Clay loam, silty clay loam, loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	30-50	15-30
	48-60	Clay loam, loam	CL	A-6, A-7	0-10	95-100	90-100	85-95	60-80	30-50	15-30
BoC2, BoD2, BoE2-	0-6	Silt loam--------	ML, CL-ML, CL	A-4, A-6	0	95-100	95-100	85-100	65-90	25-35	4-12
Bonnell	6-21	Silty clay loam, clay, clay loam.	CH, CL	A-7	0	95-100	95-100	90-100	75-95	50-65	30-40
	21-50	Clay loam, silty clay loam, loam.		A-6, A-7	0-5	95-100	90-100	85-95	60-80	30-50	15-30
	50-60	Clay loam, loam	CL	A-6, A-7	0-10	95-100	90-100	85-95	60-80	30-50	15-30
BpD3----------	0-3	Clay loam--------	CL	A-6	0	95-100	95-100	85-100	65-90	30-40	11-16
Bonnell	3-47	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	30-50	15-30
	47-60	Clay loam, loam	CL	A-6, A-7	0-10	95-100	90-100	85-95	60-80	30-50	15-30
BrC3----------	0-6	Silty clay loam	CL	A-6	0	95-100	95-100	85-100	65-90	30-40	11-16
Bonnell	6-34	Silty clay, clay, clay loam.	CH	A-7	0	95-100	95-100	90-100	75-95	50-65	30-40
	34-75	Clay loam, silty clay loam.	CL	A-6, A-7	0-5	95-100	90-100	85-95	60-80	30-50	15-30
	75-80	Clay loam, loam	CL	A-6, A-7	0-10	95-100	90-100	85-95	60-80	30-50	15-30
CbC2----------	0-6	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	80-97	25-40	1-15
Carmel	6-15	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	25-45	10-20
	15-42	Clay, silty clay	CH	A-7	0-10		100	90-100	75-97	50-65	30-40
	42	Weathered bedrock	---	---	---	---	---	---	---	---	---
CkB2, CkC2------	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
Cincinnati	7-24	Silty clay loam, loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	25-40	8-15
	24-70	Clay loam, loam, silt loam.	CL, CL-ML	A-6, A-4	0	95-100	85-95	75-90	65-80	25-40	6-20
	70-80	Clay loam, loam	CL, ML, CL-ML	A-6, A-4	0	95-100	85-95	75-90	65-80	25-40	5-20

TABLE 16.—ENGINEERING INDEX PROPERTIES—Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
CkC3---------- Cincinnati	0-7	Silt loam--------	ML, CL	A-4, A-6	0	100	100	90-100	80-100	25-40	3-16
	7-16	Silty clay loam, loam, silt loam.	CL	A-6, A-4	0	95-100	90-100	90-100	70-100	25-40	8-15
	16-55	Silt loam, loam, silty clay loam.	CL, CL-ML	A-6, A-4	0	95-100	85-95	75-90	65-80	25-40	6-20
	55-70	Clay loam, loam	CL, ML, CL-ML	A-6, A-4	0	95-100	85-95	75-90	65-80	25-40	5-20
	70-80	Clay loam, loam	CL, CL-ML	A-6, A-4	0	95-100	80-95	70-90	55-80	25-40	5-20
Cm---------- Cobbsfork	0-13	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	90-100	70-90	15-30	3-10
	13-21	Silt loam--------	CL, ML, CL-ML	A-4	0	100	100	90-100	70-95	15-30	3-10
	21-70	Silt loam, silty clay loam.	CL, CL-ML	A-4, A-6	0	100	100	95-100	75-95	20-35	5-15
	70-80	Silt loam, silty clay loam.	CL, CL-ML	A-6, A-6	0	100	100	95-100	75-95	20-35	5-15
CoG---------- Corydon	0-7	Silty clay loam	CL	A-6, A-7	0-15	85-95	85-95	80-95	70-90	20-35	15-25
	7-17	Silty clay loam, silty clay, flaggy loam.	CL	A-6, A-7	5-20	70-90	65-90	60-85	55-80	20-35	15-30
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Cy---------- Cyclone	0-17	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	95-100	80-95	25-40	5-15
	17-52	Silty clay loam, silt loam.	CL	A-6, A-7	0	100	100	95-100	85-95	30-50	15-30
	52-57	Loam----------	CL, CL-ML	A-4, A-6	0	95-100	85-100	80-95	50-80	25-40	4-15
	57-65	Loam----------	CL-ML, CL	A-4, A-6	0	90-100	85-100	75-95	50-75	20-30	6-15
Db---------- Dearborn	0-10	Loam----------	CL-ML, CL	A-4, A-6	0-10	90-95	85-95	70-95	55-85	25-40	5-20
	10-15	Clay loam, flaggy loam, channery loam.	CL, SC	A-6, A-7	0-20	85-90	75-90	65-90	45-80	30-45	10-20
	15-60	Extremely channery loam, very channery clay loam, very flaggy silt loam.	CL-ML, CL, GC, SC	A-4, A-6, A-2-4, A-2-6	25-80	65-75	50-75	50-75	30-60	25-40	4-15
EbE2---------- Eden	0-5	Flaggy silty clay	CL, CH	A-7, A-6	0-25	75-95	70-95	70-95	65-95	35-65	12-35
	5-25	Flaggy silty clay, very flaggy clay, silty clay.	CH, CL	A-7	10-45	75-100	55-100	50-100	50-95	45-75	20-45
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
EdG---------- Eden	0-4	Very flaggy silty clay.	CL, CH	A-7, A-6	35-45	75-95	70-95	70-95	65-95	35-65	12-35
	4-23	Flaggy silty clay, very flaggy clay, silty clay.	CH, CL	A-7	10-45	75-100	55-100	50-100	50-95	45-75	20-45
	23	Weathered bedrock	---	---	---	---	---	---	---	---	---
EeD2---------- Edenton	0-5	Silt loam--------	CL, CL-ML	A-4, A-6	0-5	95-100	90-100	85-95	60-90	20-40	4-15
	5-27	Clay loam, silty clay loam, clay.	CL, CH	A-6, A-7	0-10	95-100	70-95	65-90	60-90	32-62	12-35
	27-34	Silty clay, silty clay loam, channery clay.	CH, CL	A-7, A-6	0-15	95-100	70-95	65-90	60-90	32-72	15-44
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
ElA, ElB--------- Eldean	0-8	Loam----------	ML, CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	55-90	20-40	4-14
	8-25	Gravelly clay, sandy clay, gravelly clay loam.	CL, ML	A-7, A-6	0-5	75-100	60-100	55-95	50-80	38-50	12-23
	25-30	Gravelly clay, loam, gravelly sandy clay loam.	CL, GC, SC	A-4, A-6, A-7, A-2	0-10	55-85	45-85	45-75	30-60	30-45	8-20
	30-60	Stratified sand to gravel.	GM, SM, GP-GM, SP-SM	A-1, A-2	0-15	30-70	20-50	5-40	0-35	---	NP
FcB--------- Fincastle	0-13	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	13-32	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	32-51	Clay loam, loam, silty clay loam.	CL	A-6	0	95-100	90-98	85-95	75-85	30-40	10-15
	51-60	Loam----------	CL	A-4, A-6	0-3	88-96	82-90	70-86	50-66	25-30	8-11
PfA*: Fincastle-------	0-14	Silt loam--------	CL, ML, CL-ML	A-4	0	100	95-100	90-100	75-93	<25	3-10
	14-38	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-15
	38-48	Clay loam, loam, silty clay loam.	CL	A-6	0	95-100	90-98	85-95	75-85	30-40	10-15
	48-60	Loam----------	CL	A-4, A-6	0-3	88-96	82-90	70-86	50-66	25-30	8-11
Reesville-------	0-13	Silt loam--------	ML, CL-ML	A-4	0	100	90-100	90-100	85-100	25-35	4-10
	13-52	Silty clay loam, silt loam.	CL, CL-ML	A-6, A-7, A-4	0	100	90-100	90-100	90-100	20-50	4-28
	52-56	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	90-100	85-100	80-90	20-40	4-20
	56-60	Loam, silt loam	ML, CL, CL-ML	A-4, A-6	0	90-100	85-95	80-90	70-90	20-40	3-18
FxC3*: Fox----------	0-6	Gravelly sandy clay loam.	SC, CL	A-2, A-6	0-3	75-85	65-75	55-75	25-75	25-40	10-20
	6-25	Gravelly sandy clay loam, loam, gravelly sandy loam.	CL, SC	A-2, A-6, A-7	0-5	55-100	55-100	30-95	15-80	25-45	10-25
	25-60	Sand and gravel, sand, loamy coarse sand.	SP, SM, GP, GM	A-1, A-2, A-3	0-10	30-100	30-100	15-95	2-10	---	NP
Fox----------	0-6	Loam----------	ML, CL, SM, SC	A-4	0	70-100	65-100	60-95	45-90	<25	3-8
	6-25	Gravelly sandy clay loam, silt loam, gravelly sandy loam.	CL, SC, GC	A-2, A-6, A-7	0	65-100	55-100	35-100	20-95	22-50	10-25
	25-60	Sand and gravel, sand, loamy coarse sand.	SP, GP, SP-SM, GP-GM	A-1, A-2, A-3	0-10	30-100	30-100	10-95	2-10	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Gd, Ge---------- Gessie	0-10	Loam----------	CL	A-4, A-6	0	100	100	85-95	60-75	23-30	7-11
	10-44	Loam, silt loam	CL	A-4, A-6	0	100	100	85-95	60-90	23-30	7-11
	44-60	Loamy coarse sand, sand.	SM, SP-SM	A-2-4, A-1-b	0	95-100	85-100	40-75	12-30	<16	NP-4
HeC---------- Hennepin	0-7	Loam----------	CL, CL-ML	A-4, A-6	0-5	90-100	85-100	70-100	60-95	25-40	5-20
	7-15	Loam, sandy loam, silt loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
	15-60	Loam, sandy loam, clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-7	0-5	85-100	80-100	65-100	35-95	20-50	5-25
Ht---------- Holton	0-11	Silt loam--------	CL, CL-ML, ML	A-4	0-10	90-100	85-100	80-100	60-90	<25	2-10
	11-32	Silt loam, loam, sandy loam.	CL-ML, CL, SM-SC, SC	A-4, A-2, A-6	0-10	90-100	85-100	50-90	20-85	<25	4-12
	32-60	Stratified loamy fine sand to sandy clay loam.	SC, SM-SC, CL, CL-ML	A-4, A-2, A-6	0-40	75-100	60-100	55-90	30-55	<25	2-14
MmB2, MmC2, MmD2- Miami	0-8	Silt loam--------	CL, CL-ML,	A-4	0	100	95-100	80-100	50-90	15-30	3-10
	8-28	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	28-34	Loam, clay loam	CL, SC	A-4, A-6	0-3	85-100	85-100	70-90	40-95	25-35	8-15
	34-60	Loam----------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
MoC3, MoD3------- Miami	0-5	Clay loam--------	CL	A-6	0	100	90-100	75-95	65-95	30-40	15-20
	5-20	Clay loam, silty clay loam.	CL, SC	A-6	0	90-100	85-100	70-95	40-95	30-40	15-25
	20-24	Loam, clay loam	CL, SC	A-4, A-6	0-3	85-100	85-100	70-90	40-95	25-35	8-15
	24-60	Loam----------	CL, CL-ML, SC, SM-SC	A-4, A-6	0-3	85-100	85-100	70-90	45-70	20-40	5-20
Mr---------- Milford	0-9	Silty clay loam	CL, CH	A-7	0	100	95-100	90-100	75-95	40-60	20-35
	9-31	Silty clay, silty clay loam, silt loam.	CH, CL	A-7	0	100	95-100	90-100	75-100	40-60	20-40
	31-60	Stratified silty clay to silt loam.	CL	A-6, A-7	0	97-100	95-100	90-100	50-100	25-50	10-30
Mt, Mx---------- Moundhaven	0-14	Sandy loam-------	SM	A-4, A-2-4	0	100	100	60-70	30-40	<20	NP-3
	14-60	Stratified sand to silt loam.	SW-SM, SM, SP-SM	A-3, A-2-4	0	100	95-100	50-80	5-35	<20	NP-3
OcA, OcB2-------- Ockley	0-12	Loam----------	CL, ML, CL-ML	A-4	0	95-100	85-100	70-100	50-90	15-30	3-10
	12-36	Clay loam, sandy clay loam, silt loam.	CL	A-6, A-4	0	90-100	80-100	70-90	55-90	25-40	8-15
	36-46	Gravelly clay loam, gravelly sandy clay loam.	CL, SC	A-6, A-4, A-2	0-2	70-85	45-85	40-70	25-55	25-40	8-15
	46-60	Stratified loamy coarse sand to very gravelly coarse sand.	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	20-55	10-40	2-10	---	NP

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Og---------- Oldenburg	0-9	Silt loam---------	CL-ML, ML	A-4	0	95-100	95-100	90-100	70-90	<25	4-7
	9-39	Silt loam, loam	CL-ML, ML	A-4	0	95-100	95-100	80-100	55-90	<25	4-7
	39-60	Loam, sandy loam	CL-ML, SM-SC, ML, SM	A-4, A-2-4	0	95-100	95-100	55-95	25-75	<25	3-7
Pg*, Ph*. Pits											
PrC---------- Princeton	0-5	Fine sandy loam	SM, SC, ML, CL	A-4, A-2-4	0	100	100	60-85	30-55	<25	NP-10
	5-45	Sandy clay loam, fine sandy loam, loam.	SC, CL	A-6	0	100	100	70-90	35-70	25-35	10-15
	45-66	Stratified loamy fine sand to loam.	SC, SM-SC, CL, CL-ML	A-4, A-6, A-2-4, A-2-6	0	100	100	60-90	30-70	15-25	5-15
	66-70	Stratified fine sand to silt.	SM, ML, CL-ML, SM-SC	A-2-4, A-4	0	100	100	65-90	20-55	<20	NP-5
RkF---------- Rodman	0-5	Gravelly coarse sandy loam.	SM-SC, SM, SP-SM	A-1, A-2, A-4	0-2	70-85	65-85	35-60	10-40	<25	NP-5
	5-14	Gravelly loam, gravelly coarse sandy loam, loam.	ML, CL, SC, SM	A-4, A-2, A-1	0-2	70-85	60-85	40-75	20-55	<30	NP-10
	14-60	Stratified sand to very gravelly coarse [redacted].	SP, SP-SM, GP, GP-GM	A-1	1-5	30-70	15-50	7-20	2-10	---	NP
Rm---------- Ross	0-24	Silt loam---------	ML, CL-ML, CL	A-4, A-6	0	90-100	90-100	80-100	65-95	20-35	NP-12
	24-36	Loam, silt loam, silty clay loam.	ML, CL, CL-ML	A-6, A-4, A-7	0	90-100	85-100	70-100	55-95	22-45	3-20
	36-60	Stratified gravelly sandy loam to silt loam.	CL, ML, SM, GM	A-6, A-4, A-2, A-1	0-5	65-100	55-100	35-100	20-80	<30	NP-12
RsA, RsB2-------- Rossmoyne	0-7	Silt loam---------	ML	A-4	0	90-100	90-100	90-100	85-100	30-40	4-10
	7-21	Silty clay loam, silt loam, clay loam.	CL, ML	A-6, A-7, A-4	0	90-100	90-100	85-100	75-95	30-48	8-20
	21-65	Clay loam, silt loam, silty clay loam.	CL	A-6, A-4	0	90-100	85-95	80-90	70-85	25-40	9-19
	65-80	Clay loam, loam, clay.	CL	A-6, A-7, A-4	0	80-95	70-90	65-85	60-80	25-42	8-20
RuB2---------- Russell	0-8	Silt loam---------	CL-ML, CL, ML	A-4	0	100	100	90-100	70-90	<25	3-8
	8-30	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	30-50	Clay loam, loam	CL	A-6	0	95-100	90-95	80-95	60-80	30-35	10-15
	50-60	Loam----------	CL-ML, CL	A-4	0-3	85-95	80-90	65-90	50-75	<25	4-8
RvA, RvB--------- Russell	0-7	Silt loam---------	CL-ML, CL, ML	A-4, A-6	0	100	100	90-100	70-90	15-30	3-15
	7-24	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	24-49	Clay loam, loam	CL	A-4, A-6	0-3	85-100	80-95	65-95	50-80	25-40	8-16
	49-53	Loam----------	CL, CL-ML	A-6, A-4	0-3	85-100	80-95	65-90	50-75	20-30	5-15
	53	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 16.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SdB---------- Sidell	0-16	Silt loam--------	CL-ML, CL, ML	A-4	0	100	100	90-100	70-90	<25	3-8
	16-37	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	37-47	Loam----------	CL	A-4, A-6	0	95-100	90-95	75-90	55-75	25-35	8-15
	47-60	Loam----------	CL-ML, CL	A-4	0-3	85-95	80-90	65-90	50-70	<25	4-8
UaB, UnD2-------- Uniontown	0-8	Silt loam--------	CL-ML, CL	A-4	0	100	100	90-100	70-90	18-25	4-8
	8-48	Silty clay loam, silt loam.	CL	A-4, A-6	0	100	100	95-100	85-95	30-40	8-18
	48-60	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	20-30	5-11
WeB2---------- Weisburg	0-6	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-90	25-40	4-15
	6-16	Silt loam, silty clay loam.	CL-ML, CL	A-4, A-6	0	100	100	90-100	70-95	25-40	4-15
	16-39	Silt loam, silty clay loam, clay loam.	CL-ML, CL	A-4, A-6	0	95-100	LOW	80-100	65-95	25-40	5-15
	39-72	Silty clay, clay	CH	A-7	0	95-100	90-100	80-100	60-95	50-70	25-40
WmB---------- Williamstown	0-8	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-90	20-35	4-15
	8-26	Clay loam, silty clay loam.	CL	A-6	0	100	95-100	85-100	70-95	30-40	10-20
	26-32	Loam----------	CL, CL-ML	A-6, A-4	0	100	95-100	80-95	60-80	20-35	5-15
	32-60	Loam----------	ML, CL-ML, CL	A-4, A-6	0-2	100	95-100	80-95	55-75	20-35	3-11
Nu---------- Wirt	0-8	Loam----------	CL-ML, ML	A-4	0	95-100	90-100	80-100	65-90	<25	3-7
	8-40	Silt loam, loam	CL-ML, ML	A-4	0	95-100	90-100	75-100	55-90	<25	3-7
	40-60	Stratified loam to gravelly sandy loam.	SM, SM-SC, ML, CL-ML	A-4, A-2, A-1-b	0	85-100	50-100	40-95	20-75	<25	NP-7
WoB---------- Woolper	0-9	Silty clay loam	CL	A-6, A-7	0-10	95-100	90-100	85-100	75-100	34-42	15-22
	9-19	Silty clay, silty clay loam, clay.	CL, CH	A-7, A-6	0-10	95-100	90-100	85-100	75-100	35-65	15-40
	19-80	Clay, silty clay	CH, CL	A-7	0-10	95-100	90-100	85-100	75-100	45-75	20-45
WrB, WrC2-------- Wynn	0-7	Silt loam--------	CL-ML, CL	A-4, A-6	0	100	100	85-100	80-90	24-38	5-15
	7-11	Silty clay loam, clay loam, silt loam.	CL	A-6, A-7	0	100	100	75-100	70-95	30-50	15-30
	11-24	Clay, silty clay loam, clay loam.	CL, CH	A-6, A-7	0-10	95-100	75-100	70-95	60-95	30-55	15-35
	24-30	Silty clay, clay loam.	CH, CL	A-7	0-15	90-100	75-95	70-95	60-90	40-60	25-40
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
WyC3---------- Wynn	0-4	Silty clay loam	CL	A-6, A-7	0	100	100	85-100	80-95	30-45	15-25
	4-14	Clay, silty clay loam, clay loam.	CL, CH	A-6, A-7	0-10	95-100	75-100	70-95	60-95	30-55	15-35
	14-21	Silty clay, clay loam.	CH, CL	A-7	0-15	90-100	75-95	70-95	60-90	40-60	25-40
	21	Weathered bedrock	---	---	---	---	---	---	---	---	---
XnA, XnB2-------- Xenia	0-9	Silt loam--------	CL, CL-ML	A-4, A-6	0	100	100	90-100	70-100	25-35	5-15
	9-28	Silty clay loam	CL	A-6, A-7	0	100	100	90-100	80-95	35-50	15-30
	28-38	Clay loam, loam	CL	A-6, A-7	0	92-100	90-95	75-95	65-75	35-50	15-30
	38-60	Loam----------	CL, ML	A-4, A-6	0-5	85-95	80-90	75-90	50-65	15-30	NP-15

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

(The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated)

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
AlA, AlB Alvin	0-10	10-15	1.45-1.65	2.0-6.0	0.14-0.20	6.6-7.3	Low	0.24	5	3	1-2
	10-46	15-28	1.45-1.65	0.2-6.0	0.12-0.20	5.6-7.3	Low	0.24			
	46-60	3-10	1.55-1.75	2.0-6.0	0.05-0.13	7.4-7.8	Low	0.24			
AvA Avonburg	0-11	10-18	1.30-1.45	0.6-2.0	0.20-0.24	3.6-7.3	Low	0.43	4	5	.5-2
	11-21	22-30	1.35-1.50	0.6-2.0	0.18-0.20	3.6-5.5	Moderate	0.43			
	21-75	22-30	1.60-1.70	<0.06	0.06-0.08	3.6-5.5	Moderate	0.43			
	75-80	14-27	1.50-1.70	<0.06	0.06-0.10	3.6-6.5	Moderate	0.43			
BnF Bonnell	0-10	15-25	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3	5	1-3
	10-48	25-60	1.45-1.60	0.06-0.2	0.14-0.19	4.5-7.3	Moderate	0.32			
	48-60	25-40	1.60-1.90	0.2-0.6	0.08-0.15	7.4-8.4	Moderate	0.32			
BoC2, BoD2, BoE2 Bonnell	0-6	15-25	1.30-1.45	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.43	3	5	1-3
	6-21	32-60	1.50-1.70	0.06-0.2	0.09-0.13	4.5-6.5	High	0.32			
	21-50	25-40	1.45-1.60	0.06-0.2	0.14-0.19	4.5-7.3	Moderate	0.32			
	50-60	20-40	1.60-1.90	0.2-0.6	0.08-0.15	7.4-8.4	Moderate	0.32			
BpD3 Bonnell	0-3	27-32	1.30-1.50	0.2-0.6	0.17-0.23	4.5-7.3	Moderate	0.43	3	5	.5-1
	3-47	27-60	1.45-1.60	0.06-0.2	0.14-0.19	4.5-7.3	Moderate	0.32			
	47-60	20-40	1.60-1.90	0.2-0.6	0.08-0.15	7.4-8.4	Moderate	0.32			
BrC3 Bonnell	0-6	27-32	1.30-1.50	0.2-0.6	0.17-0.23	4.5-7.3	Moderate	0.43	3	5	.5-1
	6-34	35-60	1.50-1.70	0.06-0.2	0.09-0.13	4.5-6.0	High	0.32			
	34-75	27-40	1.45-1.60	0.06-0.2	0.14-0.19	4.5-7.3	Moderate	0.32			
	75-80	20-40	1.60-1.90	0.2-0.6	0.08-0.15	7.4-8.4	Moderate	0.32			
CbC2 Carmel	0-6	20-27	1.30-1.50	0.6-2.0	0.22-0.24	5.1-7.3	Low	0.43	4	6	1-2
	6-15	25-40	1.40-1.60	0.6-2.0	0.18-0.20	4.5-6.5	Moderate	0.43			
	15-42	50-60	1.55-1.75	<0.06	0.09-0.11	4.5-7.3	High	0.32			
	42	---	---	---	---	---	---	---			
CkB2, CkC2 Cincinnati	0-7	15-25	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	4	6	1-3
	7-24	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.5	Low	0.37			
	24-70	24-35	1.60-1.85	0.06-0.2	0.08-0.12	4.5-5.5	Moderate	0.37			
	70-80	24-40	1.55-1.75	0.06-0.2	0.08-0.12	5.5-6.5	Moderate	0.37			
CkC3 Cincinnati	0-7	15-25	1.30-1.50	0.6-2.0	0.22-0.24	4.5-7.3	Low	0.37	3	6	.5-1
	7-16	22-35	1.45-1.65	0.6-2.0	0.15-0.19	4.5-6.5	Low	0.37			
	16-55	24-35	1.60-1.85	0.06-0.2	0.08-0.12	4.5-5.5	Moderate	0.37			
	55-70	24-40	1.55-1.75	0.06-0.2	0.08-0.12	4.5-5.5	Moderate	0.37			
	70-80	24-40	1.55-1.75	0.2-0.6	0.08-0.12	5.5-6.5	Moderate	0.37			
Cm Cobbsfork	0-13	8-18	1.30-1.60	0.06-0.2	0.22-0.24	4.5-7.3	Low	0.37	4	5	1-3
	13-21	8-22	1.30-1.60	0.06-0.2	0.20-0.22	4.5-6.5	Low	0.37			
	21-70	15-35	1.40-1.85	<0.06	0.06-0.12	3.6-6.0	Low	0.37			
	70-80	17-35	1.40-1.65	0.06-0.2	0.06-0.12	4.5-6.0	Low	0.37			
CoG Corydon	0-7	27-40	1.30-1.45	0.6-2.0	0.21-0.23	6.1-7.8	Moderate	0.32	2	7	2-4
	7-17	25-45	1.35-1.60	0.2-0.6	0.11-0.20	5.6-7.8	Moderate	0.32			
	17	---	---	---	---	---	---	---			
Cy Cyclone	0-17	18-27	1.30-1.50	0.6-2.0	0.23-0.25	6.1-7.3	Low	0.28	5	6	2-4
	17-52	24-35	1.40-1.60	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.43			
	52-57	15-25	1.40-1.60	0.6-2.0	0.15-0.19	6.6-7.8	Low	0.43			
	57-65	15-25	1.50-1.80	0.2-0.6	0.05-0.19	7.4-8.4	Low	0.43			
Db Dearborn	0-10	20-27	1.30-1.45	0.6-2.0	0.17-0.21	7.4-8.4	Low	0.37	3	5	1-4
	10-15	20-35	1.40-1.60	0.6-2.0	0.13-0.17	7.4-8.4	Low	0.28			
	15-60	20-35	1.50-1.75	0.6-2.0	0.05-0.07	7.4-8.4	Low	0.28			

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
EbE2----------	0-5	40-60	1.45-1.65	0.2-0.6	0.11-0.17	6.6-8.4	Moderate-----	0.17	3	8	.5-3
Eden	5-25	40-60	1.45-1.65	0.06-0.2	0.08-0.13	6.6-8.4	Moderate-----	0.28			
	25	---	---	---	---	---	----------	---			
EdG----------	0-4	40-60	1.45-1.65	0.2-0.6	0.11-0.17	6.6-8.4	Moderate-----	0.17	3	8	2-4
Eden	4-23	40-60	1.45-1.65	0.06-0.2	0.08-0.13	6.6-8.4	Moderate-----	0.28			
	23	---	---	---	---	---	----------	---			
EeD2----------	0-5	18-27	1.30-1.50	0.6-2.0	0.17-0.19	5.6-7.3	Low----------	0.43	3	6	1-3
Edenton	5-27	30-40	1.40-1.65	0.06-0.2	0.16-0.18	5.1-6.0	Moderate-----	0.32			
	27-34	40-50	1.40-1.75	0.06-0.2	0.14-0.16	6.6-7.8	Moderate-----	0.32			
	34	---	---	---	---	---	----------	---			
ElA, ElB----------	0-8	15-25	1.30-1.50	0.6-2.0	0.18-0.22	5.6-7.3	Low----------	0.37	4	5	1-3
Eldean	8-25	35-48	1.40-1.60	0.6-2.0	0.08-0.14	5.6-7.3	Moderate-----	0.37			
	25-30	25-45	1.30-1.60	0.6-2.0	0.07-0.14	6.6-7.3	Low----------	0.37			
	30-60	2-8	1.55-1.70	>6.0	0.01-0.04	7.4-8.4	Low----------	0.10			
FcB----------	0-13	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	5	1-3
Fincastle	13-32	23-35	1.45-1.65	0.6-2.0	0.18-0.20	4.5-7.3	Moderate-----	0.37			
	32-51	24-32	1.45-1.65	0.6-2.0	0.15-0.19	5.1-7.8	Moderate-----	0.37			
	51-60	20-26	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
PfA*:											
Fincastle-------	0-14	11-22	1.40-1.55	0.6-2.0	0.22-0.24	5.1-7.3	Low----------	0.37	5	5	1-3
	14-38	23-35	1.45-1.65	0.6-2.0	0.18-0.20	6.1-7.3	Moderate-----	0.37			
	38-48	24-32	1.45-1.65	0.6-2.0	0.15-0.19	7.4-7.8	Moderate-----	0.37			
	48-60	20-26	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
Reesville-------	0-13	12-20	1.20-1.45	0.6-2.0	0.17-0.24	5.1-7.3	Low----------	0.37	5	5	1-2
	13-52	24-35	1.30-1.55	0.6-2.0	0.17-0.22	6.1-7.3	Moderate-----	0.37			
	52-56	20-25	1.30-1.60	0.6-2.0	0.15-0.20	7.4-8.4	Low----------	0.37			
	56-60	12-25	1.70-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
FxC3*:											
Fox gravelly sandy clay loam	0-6	20-35	1.55-1.65	0.6-2.0	0.13-0.20	5.1-7.3	Moderate-----	0.24	3	8	.5-2
	6-25	15-35	1.55-1.65	0.6-2.0	0.10-0.19	5.6-8.4	Moderate-----	0.32			
	25-60	0-2	1.30-1.80	6-20	0.02-0.07	7.4-8.4	Low----------	0.10			
Fox loam--------	0-6	10-17	1.35-1.55	0.6-2.0	0.17-0.24	5.1-7.3	Low----------	0 37	4	5	1-3
	6-25	15-35	1.55-1.65	0.6-2.0	0.10-0.22	5.6-7.3	Moderate-----	0.43			
	25-60	0-2	1.30-1.80	6-20	0.02-0.7	7.4-8.4	Low----------	0.10			
Gd, Ge----------	0-10	18-27	1.45-1.60	0.6-2.0	0.20-0.22	7.4-8.4	Low----------	0.32	5	4L	1-2
Gessie	10-44	18-27	1.45-1.60	0.6-2.0	0.17-0.22	7.4-8.4	Low----------	0.32			
	44-60	5-12	1.60-1.70	6.0-20.0	0.05-0.07	7.4-8.4	Low----------	0.15			
HeG----------	0-7	20-30	1.20-1.40	0.6-2.0	0.18-0.24	6.1-7.8	Low----------	0.32	4	5	1-2
Hennepin	7-15	18-30	1.30-1.60	0.6-2.0	0.14-0.22	6.1-8.4	Low----------	0.32			
	15-60	18-30	1.45-1.70	0.2-0.6	0.07-0.11	7.4-8.4	Low----------	0.32			
Ht----------	0-11	5-18	1.20-1.45	0.6-2.0	0.15-0.20	5.6-7.3	Low----------	0.37	5	5	1-3
Holton	11-32	5-18	1.25-1.45	0.6-2.0	0.13-0.17	5.6-7.3	Low----------	0.24			
	32-60	5-20	1.25-1.45	0.6-2.0	0.07-0.16	5.6-7.3	Low----------	0.24			
MmB2, MmC2, MmD2-	0-8	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-7.3	Low----------	0.37	5	5	.5-3
Miami	8-28	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.5	Moderate-----	0.37			
	28-34	20-30	1.45-1.65	0.6-2.0	0.14-0.19	7.4-8.4	Low----------	0.37			
	34-60	12-25	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Moderate-----	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS—Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
MoC3, MoD3 Miami	0-5	27-35	1.35-1.60	0.6-2.0	0.18-0.20	5.6-7.3	Moderate	0.37	3	6	.5-1
	5-20	27-35	1.45-1.65	0.6-2.0	0.15-0.20	5.6-6.5	Moderate	0.37			
	20-24	20-30	1.45-1.65	0.6-2.0	0.14-0.19	7.3-8.4	Low	0.37			
	24-60	12-25	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Moderate	0.37			
Mr Milford	0-9	35-42	1.30-1.50	0.6-2.0	0.12-0.23	5.6-7.3	High	0.28	5	4	2-4
	9-31	25-42	1.40-1.65	0.2-0.6	0.18-0.20	6.6-7.8	Moderate	0.43			
	31-60	20-42	1.50-1.70	0.2-0.6	0.20-0.22	6.6-8.4	Moderate	0.43			
Mt, Mx Houghaven	0-14	4-10	1.50-1.60	6.0-20	0.13-0.15	7.4-8.4	Low	0.24	5	3	1-2
	14-60	1-8	1.50-1.65	6.0-20	0.05-0.10	7.4-8.4	Low	0.17			
OcA, OcB2 Ockley	0-12	11-22	1.30-1.45	0.6-2.0	0.20-0.24	5.6-6.5	Low	0.37	5	5	.5-3
	12-36	20-35	1.45-1.60	0.6-2.0	0.15-0.22	5.6-7.3	Moderate	0.37			
	36-46	20-35	1.40-1.55	0.6-2.0	0.06-0.11	5.6-7.3	Moderate	0.24			
	46-60	2-5	1.60-1.80	>20	0.02-0.04	7.4-8.4	Low	0.10			
Og Oldenburg	0-9	8-18	1.40-1.50	0.6-2.0	0.20-0.24	5.6-7.3	Low	0.37	5	5	1-2
	9-39	8-18	1.40-1.55	0.6-2.0	0.15-0.22	5.6-7.3	Low	0.37			
	39-60	10-18	1.40-1.55	0.6-2.0	0.11-0.19	5.6-7.3	Low	0.28			
Pg*, Ph*. Pits											
PrC Princeton	0-5	12-20	1.35-1.50	0.6-2.0	0.13-0.18	5.6-7.3	Low	0.24	5-4	3	.5-2
	5-45	18-25	1.40-1.55	0.6-2.0	0.16-0.18	5.1-6.5	Low	0.32			
	45-66	8-18	1.40-1.55	0.6-2.0	0.12-0.14	5.1-7.3	Low	0.32			
	66-70	4-10	1.45-1.60	0.6-2.0	0.06-0.08	6.1-8.4	Low	0.17			
RXf Rodman	0-5	5-20	1.10-1.40	2.0-6.0	0.09-0.12	6.6-7.8	Low	0.15	3	8	2-4
	5-14	5-25	1.10-1.50	2.0-6.0	0.09-0.12	6.6-7.8	Low	0.20			
	14-60	0-10	1.80-2.00	>20	0.02-0.04	7.4-8.4	Low	0.10			
Rm Ross	0-24	15-27	1.20-1.45	0.6-2.0	0.19-0.24	6.1-7.8	Low	0.32	5	5	2-5
	24-36	18-32	1.20-1.50	0.6-2.0	0.16-0.22	6.6-8.4	Low	0.32			
	36-60	5-25	1.35-1.60	0.6-6.0	0.05-0.18	7.4-8.4	Low	0.32			
RsA, RsB2 Rossmoyne	0-7	13-27	1.35-1.50	0.6-2.0	0.20-0.24	4.5-7.3	Low	0.37	4	6	1-3
	7-21	22-35	1.40-1.60	0.6-2.0	0.14-0.19	3.6-5.5	Moderate	0.37			
	21-65	24-35	1.70-1.90	0.06-0.2	0.06-0.10	3.6-6.0	Moderate	0.37			
	65-80	18-45	1.60-1.75	0.06-0.2	0.06-0.10	5.1-8.4	Moderate	0.37			
RuB2 Russell	0-8	10-20	1.30-1.45	0.6-2.0	0.22-0.24	6.1-6.5	Low	0.37	5	5	.5-2
	8-30	24-35	1.35-1.50	0.6-2.0	0.18-0.20	5.6-6.0	Moderate	0.37			
	30-50	24-32	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.8	Moderate	0.37			
	50-60	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low	0.37			
RvA, RvB Russell	0-7	11-25	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low	0.37	3	5	.5-2
	7-24	24-32	1.40-1.60	0.6-2.0	0.18-0.20	5.1-6.5	Moderate	0.37			
	24-49	23-33	1.40-1.60	0.6-2.0	0.15-0.19	5.6-7.3	Moderate	0.37			
	49-53	15-25	1.70-1.80	0.2-0.6	0.05-0.10	7.4-8.4	Low	0.37			
	53	---	---	---	---	---	---	---			
SdB Sidell	0-16	10-20	1.30-1.40	0.6-2.0	0.22-0.24	6.6-7.3	Low	0.32	5	5	2-4
	16-37	25-35	1.40-1.50	0.6-2.0	0.18-0.20	6.1-7.3	Moderate	0.43			
	37-47	20-27	1.40-1.55	0.6-2.0	0.17-0.19	6.6-7.8	Moderate	0.32			
	47-60	12-20	1.70-1.90	0.2-0.6	0.05-0.10	7.4-8.4	Low	0.32			
UaB, UnD2 Uniontown	0-8	12-20	1.30-1.50	0.6-2.0	0.22-0.24	6.6-7.3	Low	0.43	5	5	.5-2
	8-48	18-35	1.40-1.55	0.6-2.0	0.18-0.20	6.1-7.3	Low	0.37			
	48-60	15-30	1.40-1.55	0.6-2.0	0.20-0.22	6.6-8.4	Low	0.37			

See footnote at end of table.

TABLE 17.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Moist bulk density	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	g/cc	In/hr	In/in	pH					Pct
NeB2----------	0-6	18-27	1.30-1.45	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	4	6	1-2
Neisburg	6-16	18-35	1.35-1.50	0.6-2.0	0.20-0.22	5.1-6.5	Low----------	0.37			
	16-39	18-35	1.55-1.80	<0.06	0.06-0.08	4.5-5.5	Low----------	0.37			
	39-72	40-65	1.40-1.60	<0.06	0.08-0.14	5.1-7.8	High---------	0.37			
NmB----------	0-8	14-26	1.30-1.45	0.6-2.0	0.22-0.24	5.6-7.3	Low----------	0.37	5	5	1-3
Williamstown	8-26	27-35	1.35-1.50	0.6-2.0	0.15-0.21	5.6-7.3	Moderate-----	0.37			
	26-32	18-27	1.35-1.50	0.6-2.0	0.15-0.19	6.1-7.8	Low----------	0.37			
	32-60	16-26	1.45-1.70	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			
Wn----------	0-8	10-18	1.30-1.45	0.6-2.0	0.17-0.20	6.6-7.3	Low----------	0.37	5	5	.5-3
Wirt	8-40	10-18	1.40-1.55	0.6-2.0	0.15-0.20	6.1-7.3	Low----------	0.24			
	40-60	8-18	1.45-1.60	0.6-2.0	0.11-0.17	5.6-7.3	Low----------	0.24			
WoB----------	0-9	35-40	1.30-1.50	0.6-2.0	0.18-0.22	6.1-7.8	Low----------	0.37	3	7	2-4
Woolper	9-19	36-50	1.30-1.55	0.06-0.2	0.13-0.19	6.1-7.8	Moderate-----	0.28			
	19-80	40-60	1.45-1.65	0.06-0.2	0.12-0.17	6.1-7.8	Moderate-----	0.28			
WrB, WrC2----------	0-7	17-27	1.30-1.50	0.6-2.0	0.22-0.24	5.6-6.0	Low----------	0.37	4	5	1-3
Wynn	7-11	22-40	1.35-1.55	0.2-0.6	0.15-0.20	5.6-7.3	Moderate-----	0.37			
	11-24	35-48	1.40-1.70	0.06-0.2	0.09-0.18	5.6-7.3	Moderate-----	0.37			
	24-30	35-55	1.45-1.75	0.06-0.2	0.08-0.12	6.6-8.4	High---------	0.37			
	30	---	---	---	---	---	-------------	----			
WyC3----------	0-4	27-34	1.35-1.55	0.6-2.0	0.21-0.23	5.6-6.0	Moderate-----	0.37	3	7	.5-2
Wynn	4-14	35-48	1.40-1.70	0.06-0.2	0.09-0.18	5.6-7.3	Moderate-----	0.37			
	14-21	35-55	1.45-1.75	0.06-0.2	0.08-0.12	6.6-8.4	High---------	0.37			
	21	---	---	---	---	---	-------------	----			
XnA, XnB2----------	0-9	11-22	1.40-1.55	0.6-2.0	0.22-0.24	6.6-7.3	Low----------	0.37	5	5	1-3
Xenia	9-28	27-35	1.45-1.65	0.2-0.6	0.18-0.20	5.6-7.3	Moderate-----	0.37			
	28-38	23-35	1.45-1.65	0.2-0.6	0.15-0.19	5.6-7.3	Moderate-----	0.37			
	38-60	12-27	1.55-1.90	0.2-0.6	0.05-0.19	7.4-8.4	Low----------	0.37			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--SOIL AND WATER FEATURES

("Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated)

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
AlA, AlB---------- Alvin	B	None-------	---	---	>6.0	---	---	>60	---	Moderate	Low------	High.
AvA---------- Avonburg	D	None-------	---	---	1.0-3.0	Perched	Jan-Apr	>60	---	High- -	High-----	High.
BnF, BoC2, BoD2, BoE2, BgD3, BrC3- Bonnell	C	None-------	---	---	>6.0	---	---	>60	---	Moderate	High ----	Moderate.
CbC2---------- Carmel	C	None-------	---	---	>6.0	---	---	>40	Soft	Moderate	High-----	Moderate.
CkB2, CkC2, CkC3-- Cincinnati	C	None-------	---	---	2.5-4.0	Perched	Jan-Apr	>60	---	High-----	Moderate	High.
Co---------- Cobbsfork	D	None-------	---	---	+.5-1.0	Perched	Dec-Apr	>60	---	High----	High-----	High.
CoG---------- Corydon	D	None-------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate	Low.
Cy---------- Cyclone	B/D	None-------	---	---	+.5-1.0	Apparent	Dec-May	>60	---	High-----	High-----	Low.
Dh---------- Dearborn	B	Frequent----	Very brief	Nov-May	>6.0	---		>60	---	Moderate	Low------	Low.
EbE2, EdG---------- Eden	C	None-------	---	---	>6 0	---	---	20-40	Soft	---	Moderate	Low.
EoD2---------- Elkenton	C	None------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Moderate.
ElA, ElB---------- Eldean	B	None-------	---	---	>6.0	---	---	>60	---	Moderate	High-----	Moderate.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
FcB---------- Fincastle	C	None-------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
FfA*: Fincastle-------	C	None-------	---	---	1.0-3.0	Apparent	Jan-Apr	>60	---	High-----	High-----	Moderate.
Reesville------	C	None-------	---	---	1.0-3.0	Apparent	Jan-Apr		---	High-----	High-----	Moderate.
FrC3* Fox gravelly sandy clay loam-	B	None-------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
Fox loam-------	B	None-------	---	---	>6.0	---	---		---	Moderate	Moderate	Moderate.
Gd---------- Genesis	B	Rare-------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ge---------- Genesis	B	Occasional	Brief-----	Dec-May	>6.0	---	---	>60	---	Moderate	Low------	Low.
HeG---------- Hennepin	B	None-------	---	---	>6.0	---	---	>60	---	Moderate	Low------	Low.
Ht---------- Holton	C	Occasional	Very brief	Nov-Jun	1.0-3.0	Apparent	Nov-Jun	>60	---	High-----	Moderate	High.
MaB2, MaC2, MaD2, MoC3, MoD3------ Miami	B	None-------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
Mr---------- Milford	B/D	None-------	---	---	+.5-2.0	Apparent	Jan-Jun	>60	---	High-----	High-----	Low.
Mt---------- Moundhaven	A	Rare-------	---	---	>6.0	---	---	>60	---	Low------	Low------	Low.
Mx---------- Moundhaven	A	Occasional	Very brief	Nov-May	>6.0	---	---	>60	---	Low------	Low------	Low.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
OcA, OcB2--------- Ockley	B	None---------		---	>6.0	---	---	>60		Moderate	Moderate	Moderate.
Og--------- Oldenburg	B	Occasional	Very brief	Jan-Jun	2.0-4.0	Apparent	Dec-May	>60	---	Moderate	Moderate	Moderate.
Pg*, Ph*. Pits												
PrC--------- Princeton	B	None---------	---	---	>6.0	---	---	>60	---	Moderate	Moderate	Moderate.
RkF--------- Rodman	A	None---------	---	---	>6.0	---	---	>60	---	Low--------	Low--------	Low.
Rs--------- Ross	B	Rare---------	---	---	>6.0	---	---	>60	---	Moderate	Low--------	Low.
RsA, RsB2--------- Rossmoyne	C	None---------	---	---	1.5-3.0	Perched	Jan-Apr	>60	---	High-------	High-------	High
RuB2--------- Russell	B	None---------	---	---	>6.0	---	---	>60	---	High-------	Moderate	Moderate.
RvA, RvB--------- Russell	B	None---------	---	---	4.0-6.0	Perched	Jan-Apr	40-60	Soft	High-------	Moderate	Moderate.
SdB--------- Sidell	B	None---------	---	---	>6.0	---	---	>60	---	High-------	Moderate	Low.
UnB--------- Uniontown	B	None---------	---	---	2.5-4.0	Apparent	Nov-May	>60	---	High-------	Low--------	Moderate.
UnD2--------- Uniontown	B	None---------	---	---	>6.0	---	---	>60	---	High-------	Low--------	Moderate.
WeB2--------- Weisburg	C	None---------	---	---	>6.0	---	---	>60	---	High-------	Moderate	High.

See footnote at end of table.

TABLE 18.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness		Uncoated steel	Concrete
					Ft			In				
WmB---------- Williamstown	C	None--------		---	1.5-3.5	Perched	Jan-Apr	>60	---	High-----	Moderate	Low.
Wn---------- Wirt	B	Occasional	Brief----	Nov-Jun	>6.0	---	---	>60	---	Moderate	Low------	Moderate.
WoB---------- Woolper	C	None--------	---	---	>6.0	---	---	>60	---	---	Moderate	Low
WrB, WrC2, WyC3--- Wynn	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	High-----	Low.
XnA, XnB2--------- Xenia	B	None---- ---	---	---	2.0-6.0	Apparent	Mar-Apr	>60	---	High-----	High-----	Moderate.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 19.—CLASSIFICATION OF THE SOILS

(An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series)

Soil name	Family or higher taxonomic class
Alvin	Coarse-loamy, mixed, mesic Typic Hapludalfs
Avonburg	Fine-silty, mixed, mesic Aeric Fragiaqualfs
Bonnell	Fine, mixed, mesic Typic Hapludalfs
Carmel	Fine, vermiculitic, mesic Typic Hapludalfs
Cincinnati	Fine-silty, mixed, mesic Typic Fragiudalfs
Cobbsfork	Fine-silty, mixed, mesic Typic Ochraqualfs
*Corydon	Clayey, mixed, mesic Lithic Argiudolls
Cyclone	Fine-silty, mixed, mesic Typic Argiaquolls
Dearborn	Loamy-skeletal, mixed, mesic Fluventic Hapludolls
*Eden	Fine, mixed, mesic Typic Hapludalfs
*Edenton	Fine, mixed, mesic Typic Hapludalfs
Eldean	Fine, mixed, mesic Typic Hapludalfs
Fincastle	Fine-silty, mixed, mesic Aeric Ochraqualfs
Fox	Fine-loamy over sandy or sandy-skeletal, mixed, mesic Typic Hapludalfs
*Gessie	Fine-loamy, mixed (calcareous), mesic Typic Udifluvents
Hennepin	Fine-loamy, mixed, mesic Typic Eutrochrepts
Holton	Coarse-loamy, mixed, nonacid, mesic Aeric Fluvaquents
Miami	Fine-loamy, mixed, mesic Typic Hapludalfs
Milford	Fine, mixed, mesic Typic Haplaquolls
Moundhaven	Sandy, mixed, mesic Typic Udifluvents
Ockley	Fine-loamy, mixed, mesic Typic Hapludalfs
Oldenburg	Coarse-loamy, mixed, nonacid, mesic Aquic Udifluvents
Princeton	Fine-loamy, mixed, mesic Typic Hapludalfs
Reesville	Fine-silty, mixed, mesic Aeric Ochraqualfs
Rodman	Sandy-skeletal, mixed, mesic Typic Hapludolls
Ross	Fine-loamy, mixed, mesic Cumulic Hapludolls
Rossmoyne	Fine-silty, mixed, mesic Aquic Fragiudalfs
Russell	Fine-silty, mixed, mesic Typic Hapludalfs
Sidell	Fine-silty, mixed, mesic Typic Argiudolls
Uniontown	Fine-silty, mixed, mesic Typic Hapludalfs
Weisburg	Fine-silty, mixed, mesic Typic Fragiudalfs
Williamstown	Fine-loamy, mixed, mesic Aquic Hapludalfs
Wirt	Coarse-loamy, mixed, nonacid, mesic Typic Udifluvents
*Woolper	Fine, mixed, mesic Typic Argiudolls
Wynn	Fine, mixed, mesic Typic Hapludalfs
Xenia	Fine-silty, mixed, mesic Aquic Hapludalfs

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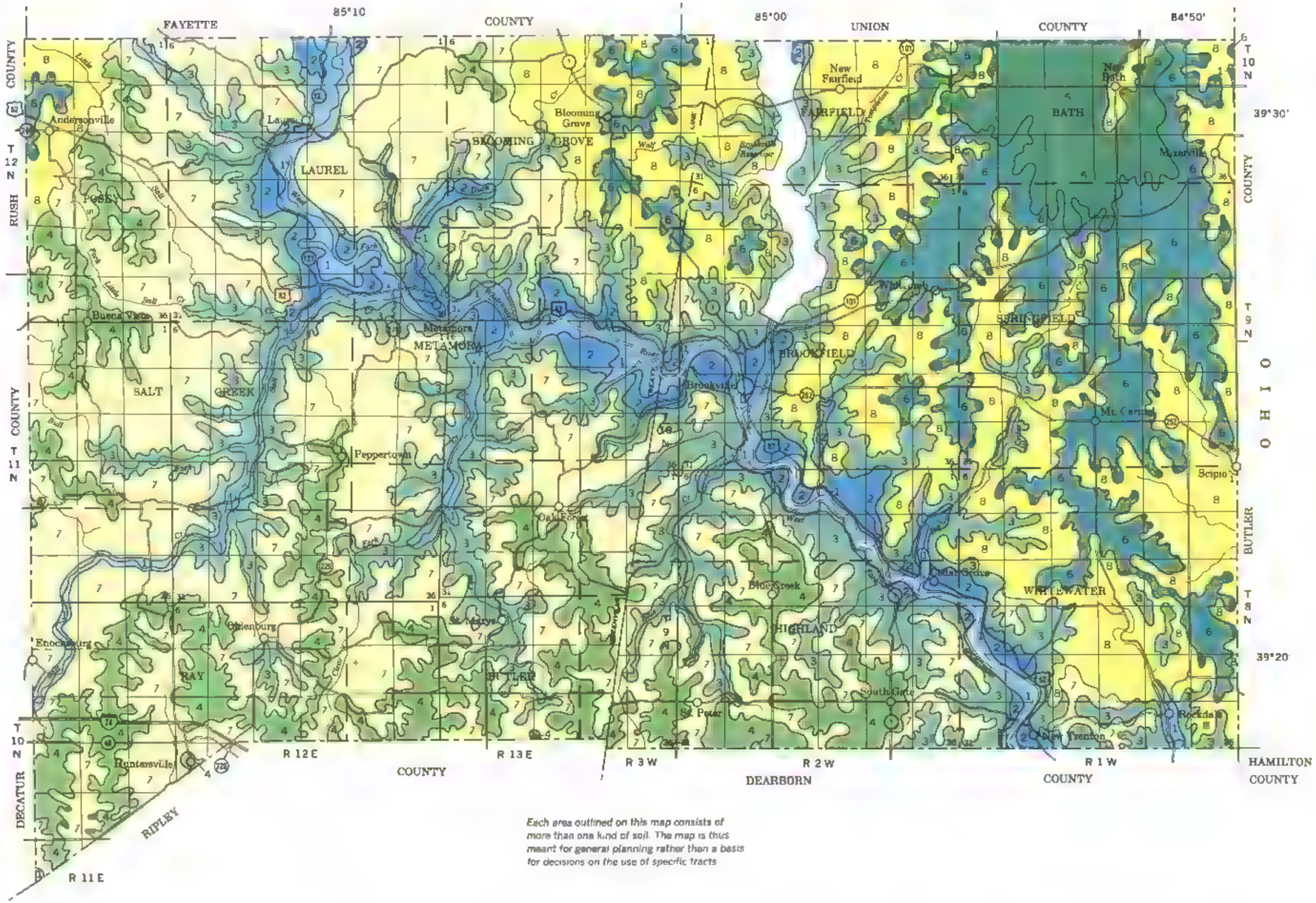


Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts

LEGEND*

1. GESSIE-MOUNDHAVEN association. Deep, nearly leve- wel drained and somewhat excessively dra ned, loamy soils formed in alluvium on flood pla ns
2. OCKLEY-ELDEAN-ALVIN association. Nearly level and gently sloping well drained loamy soils that are deep and moderately deep to sand and gravel and that formed in outwash, on river terraces
3. EDEN-CARMEL association: Moderately deep and deep, very steep to moderately sloping, wel dra ned, clayey and silty soils formed in residuum on uplands
4. AVONBURG-COBBSFORK association. Deep, nearly level, somewhat poorly dra ned and poorly drained silty soi s formed in loess and under lying glacial drift, on uplands
5. CYCLONE-FINCASTLE-REESVILLE association. Deep, nearly leve poorly dra ned and somewhat poorly drained silty soils formed in loess and underlying glacia till on uplands
6. FINCASTLE-XENIA-CYCLONE association. Deep, nearly level and gently sloping moderately well drained to poorly drained silty soils formed in loess and under ying glacial till on uplands
7. BONNELL-CINCINNATI-ROSSMOYNE association. Deep, nearly level to very steep, well drained and moderately well dra ned, silty and loamy soils formed in loess and underly ng glacia drift and in glacial till on uplands
8. MIAMI-XENIA-RUSSELL association. Deep, nearly level to strongly slop ing wel drained and moderately well drained silty and loamy soils formed in loess and underlying glacia till on uplands

*Texture terms in the descriptive headings refer to the surface layer of the major soils in the associations

COMPILED 1986

SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY AGRICULTURAL EXPERIMENT STATION
INDIANA DEPARTMENT OF NATURAL RESOURCES
SOIL AND WATER CONSERVATION COMMITTEE

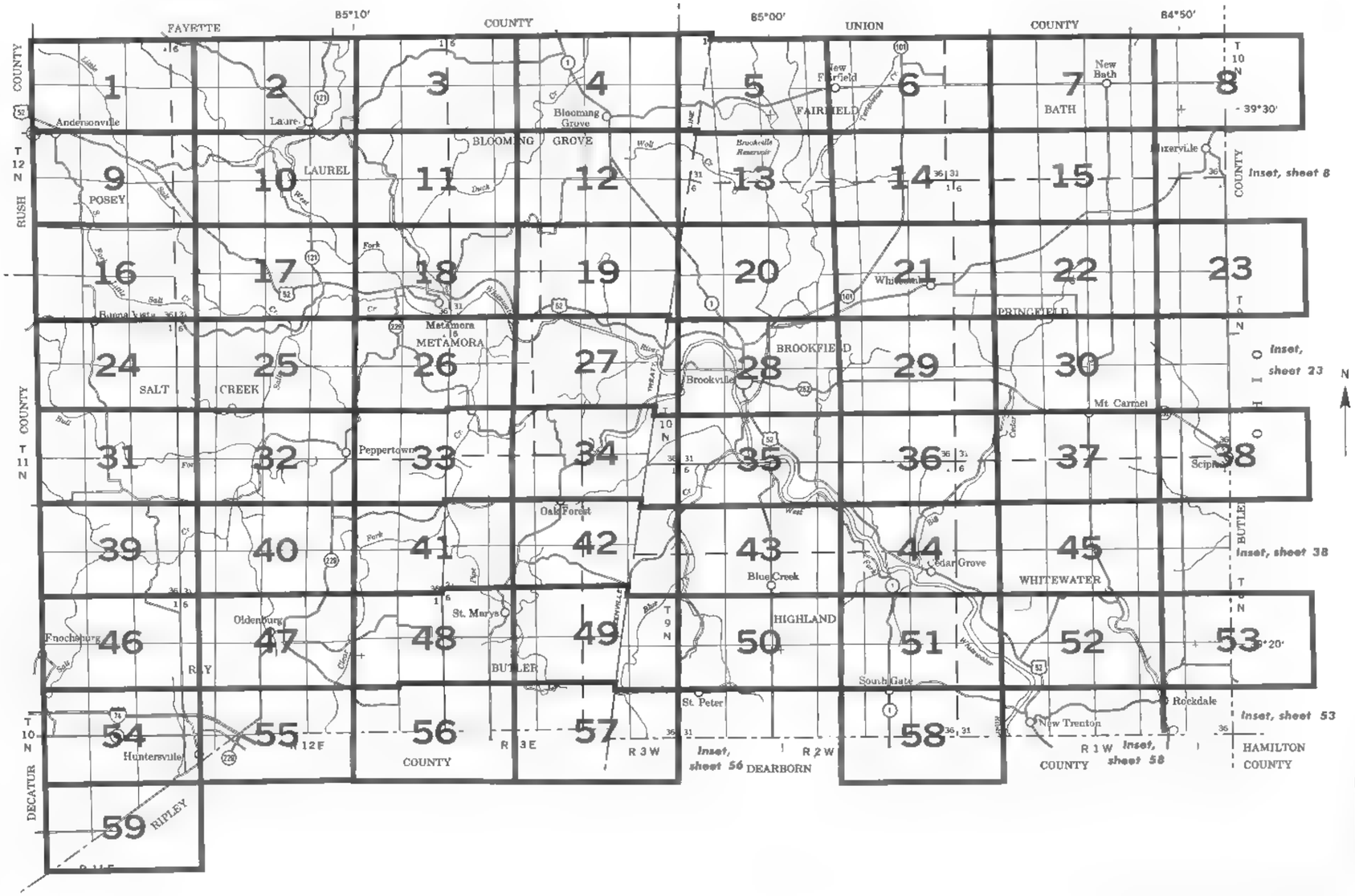
GENERAL SOIL MAP

FRANKLIN COUNTY, INDIANA

Scale 1:126,720

1 0 1 2 3 4 Miles

0 3 6 Km



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

FRANKLIN COUNTY, INDIANA

Scale 1:126,720

1 0 1 2 3 4 Miles

1 0 3 6 Km

SOIL LEGEND

Map symbols consist of a combination of letters or of letters and a number. The first capital letter is the initial one of the map unit name. The lowercase letter that follows separates map units having names that begin with the same letter, except that it does not separate sloping or eroded phases. The second capital letter indicates the class of slope. Symbols without a slope letter are for nearly level soils or miscellaneous areas. A final number of 2 indicates that the soil is eroded and 3 that it is severely eroded.

SYMBOL	NAME
AlA	Alvin sandy loam, 0 to 2 percent slopes
AlB	Alvin sandy loam, 2 to 6 percent slopes
AvA	Avonburg silt loam, 0 to 2 percent slopes
BnF	Bonnell loam, 25 to 50 percent slopes
BoC2	Bonnell silt loam, 6 to 12 percent slopes, eroded
BoD2	Bonnell silt loam, 12 to 18 percent slopes, eroded
BoE2	Bonnell silt loam, 18 to 25 percent slopes, eroded
BpD3	Bonnell clay loam, 12 to 18 percent slopes, severely eroded
BrC3	Bonnell silty clay loam, 6 to 12 percent slopes, severely eroded
CbC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded
CkB2	Cincinnati silt loam, 2 to 6 percent slopes, eroded
CkC2	Cincinnati silt loam, 6 to 12 percent slopes, eroded
CkC3	Cincinnati silt loam, 6 to 12 percent slopes, severely eroded
Cm	Colebrook silt loam
CoG	Corydon silty clay loam, 18 to 50 percent slopes
Cy	Cyclone silt loam
Db	Dearborn loam, frequently flooded
EbE2	Eden flaggy silty clay, 18 to 25 percent slopes, eroded
EdG	Eden very flaggy silty clay, 25 to 60 percent slopes, stony
EeD2	Elkenton silt loam, 12 to 18 percent slopes, eroded
ElA	Eldean loam, 0 to 2 percent slopes
ElB	Eldean loam, 2 to 6 percent slopes
FcB	Fincastle silt loam, 2 to 6 percent slopes
FfA	Fincastle-Reesville silt loams, 0 to 4 percent slopes
FxC3	Fox complex, 6 to 15 percent slopes, severely eroded
Gd	Gessie loam, sandy substratum, rarely flooded
Ge	Gessie loam, sandy substratum, occasionally flooded
HeG	Hennepin loam, 25 to 60 percent slopes
Ht	Holton silt loam, occasionally flooded
MnB2	Miami silt loam, 2 to 6 percent slopes, eroded
MnC2	Miami silt loam, 6 to 12 percent slopes, eroded
MnD2	Miami silt loam, 12 to 18 percent slopes, eroded
MoC3	Miami clay loam, 6 to 12 percent slopes, severely eroded
MoD3	Miami clay loam, 12 to 18 percent slopes, severely eroded
Mr	Millgrove silty clay loam
Mt	Moundhaven sandy loam, rarely flooded
Mx	Moundhaven sandy loam, occasionally flooded
OcA	Ockley loam, 0 to 2 percent slopes
OcB2	Ockley loam, 2 to 6 percent slopes, eroded
Og	Oldenburg silt loam, occasionally flooded
Pg	Pits, gravel
Ph	Pits, quarries
PrC	Princeton fine sandy loam, 4 to 12 percent slopes
RkF	Rodman gravelly coarse sandy loam, 35 to 60 percent slopes
Rm	Ross silt loam, rarely flooded
RsA	Rossmoyne silt loam, 0 to 2 percent slopes
RsB2	Rossmoyne silt loam, 2 to 6 percent slopes, eroded
RuB2	Russell silt loam, 2 to 6 percent slopes, eroded
RvA	Russell silt loam, bedrock substratum, 0 to 2 percent slopes
RvB	Russell silt loam, bedrock substratum, 2 to 6 percent slopes
SdB	Sadell silt loam, 1 to 4 percent slopes
UaB	Ava-Uniontown silt loam, moderately wet, 2 to 6 percent slopes
UnD2	Uniontown silt loam, 12 to 25 percent slopes, eroded
WeB2	Weisburg silt loam, 2 to 6 percent slopes, eroded
WmB	Williamstown silt loam, 1 to 4 percent slopes
Wn	Wirt loam, occasionally flooded
WoB	Woolper silty clay loam, 1 to 6 percent slopes
WrB	Wynn silt loam, 1 to 6 percent slopes
WrC2	Wynn silt loam, 6 to 12 percent slopes, eroded
WyC3	Wynn silty clay loam, 6 to 12 percent slopes, severely eroded
XnA	Xenia silt loam, 0 to 2 percent slopes
XnB2	Xenia silt loam, 2 to 6 percent slopes, eroded

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Land of soil survey (label)
- Field sheet matching and neatline

AD HOC BOUNDARY (label)

- Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown in scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
- Double-lined (label)
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring
- Well, artesian
- Well, irrigation
- Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

- SOIL DELINEATIONS AND SYMBOLS
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE (normally not shown)
- MISCELLANEOUS
  - Blowout
  - Clay spot
  - Gravelly spot
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop (includes sandstone and shale)
  - Saline spot
  - Sandy spot
  - Severely eroded spot
  - Slide or slip (tips point upslope)
  - Stony spot, very stony spot
  - Area with bedrock at 20 to 60 inches deep, up to 5 acres in size
  - Cut and Fill area, up to 5 acres in size
  - Landfill, up to 5 acres in size

FRANKLIN COUNTY, INDIANA — SHEET NUMBER 1

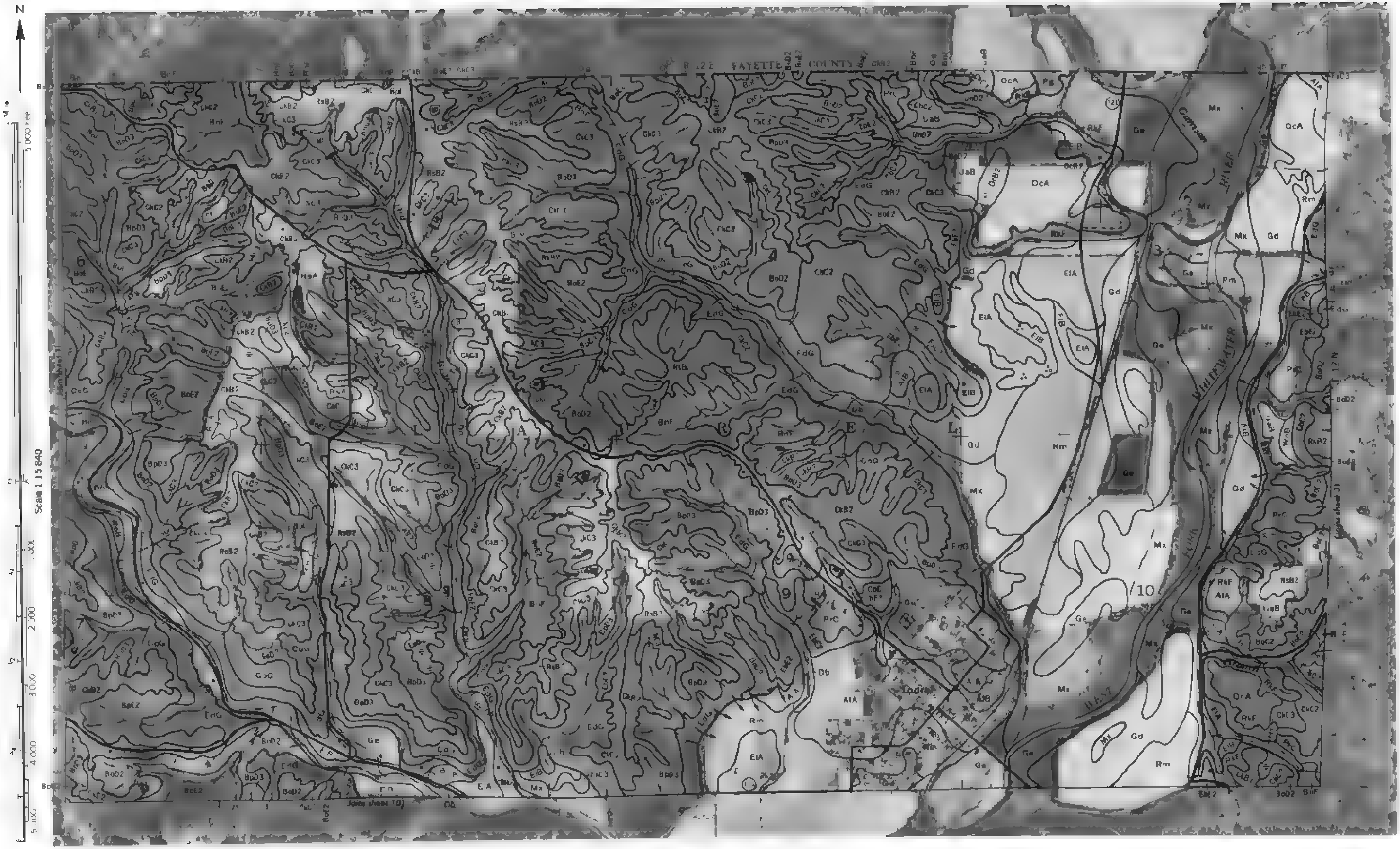
FRANKLIN COUNTY, INDIANA NO. 1

FAYETTE COUNTY

Andersonville

Scale 1:15,840

(2)



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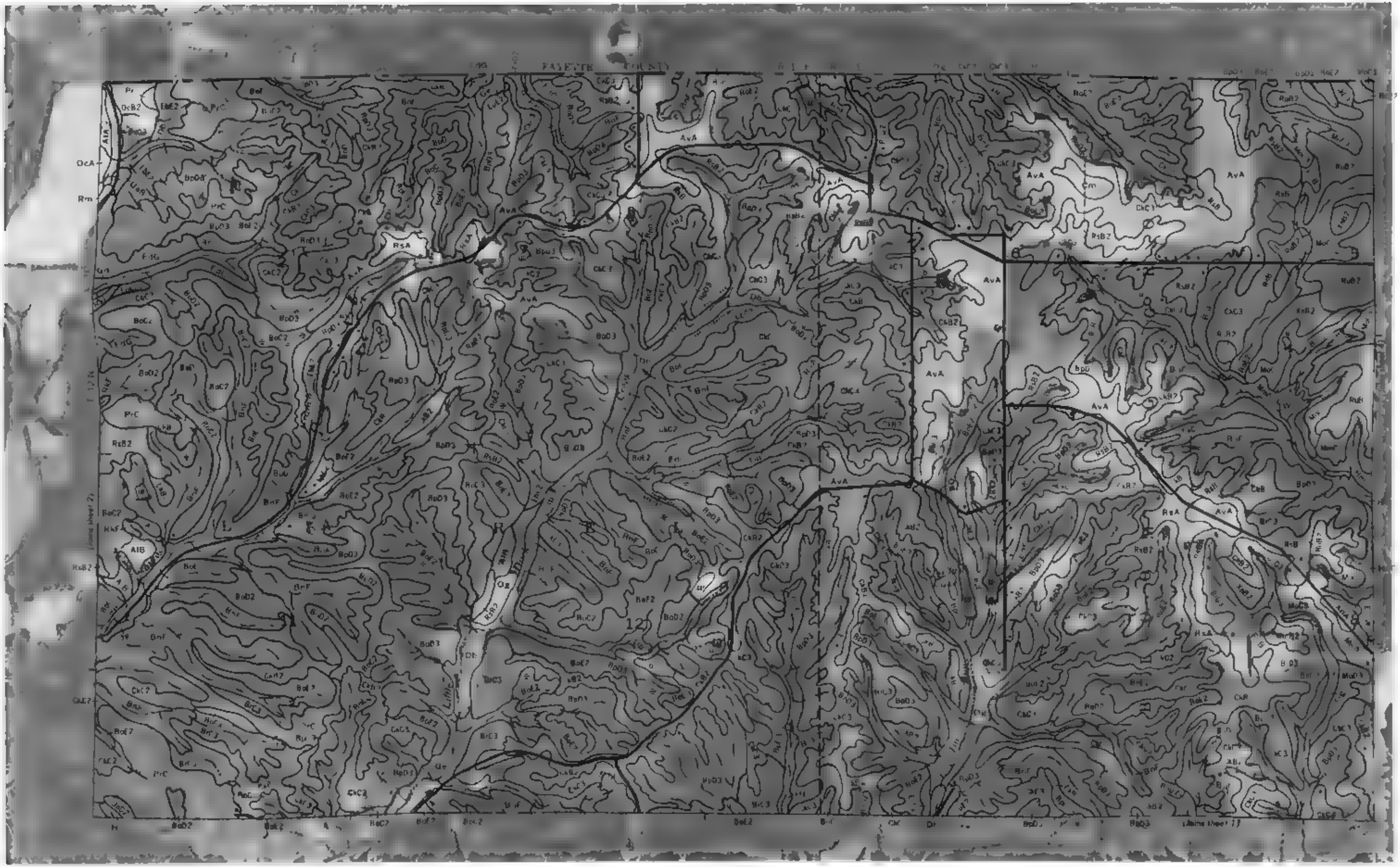
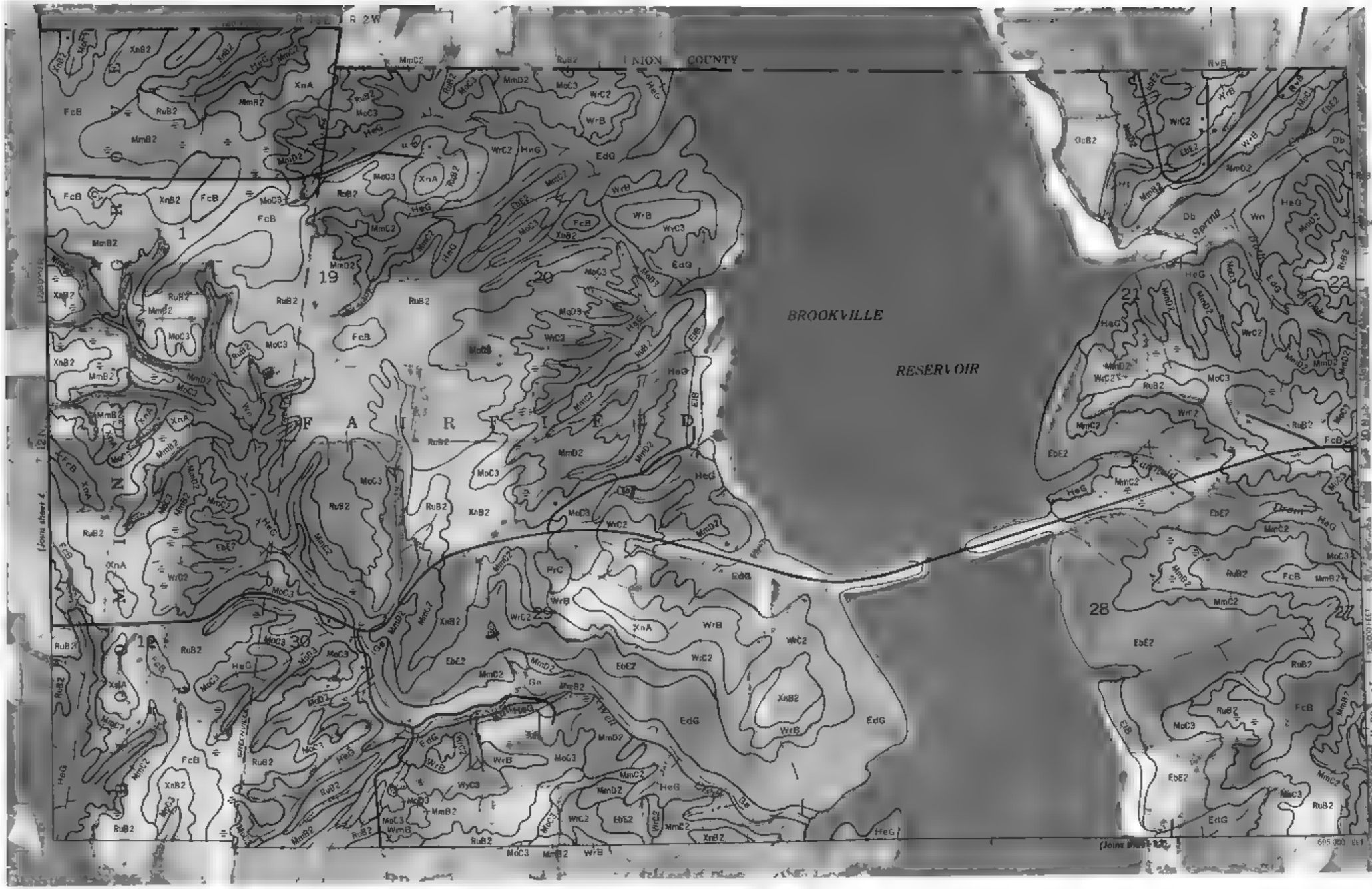


FRANKLIN COUNTY INDIANA NO 3

FRANKLIN COUNTY, INDIANA — SHEET NUMBER 4

FRANKLIN COUNTY INDIANA NO 4

FRANKLIN COUNTY INDIANA NO 5



6

N

Scale 1:15 840

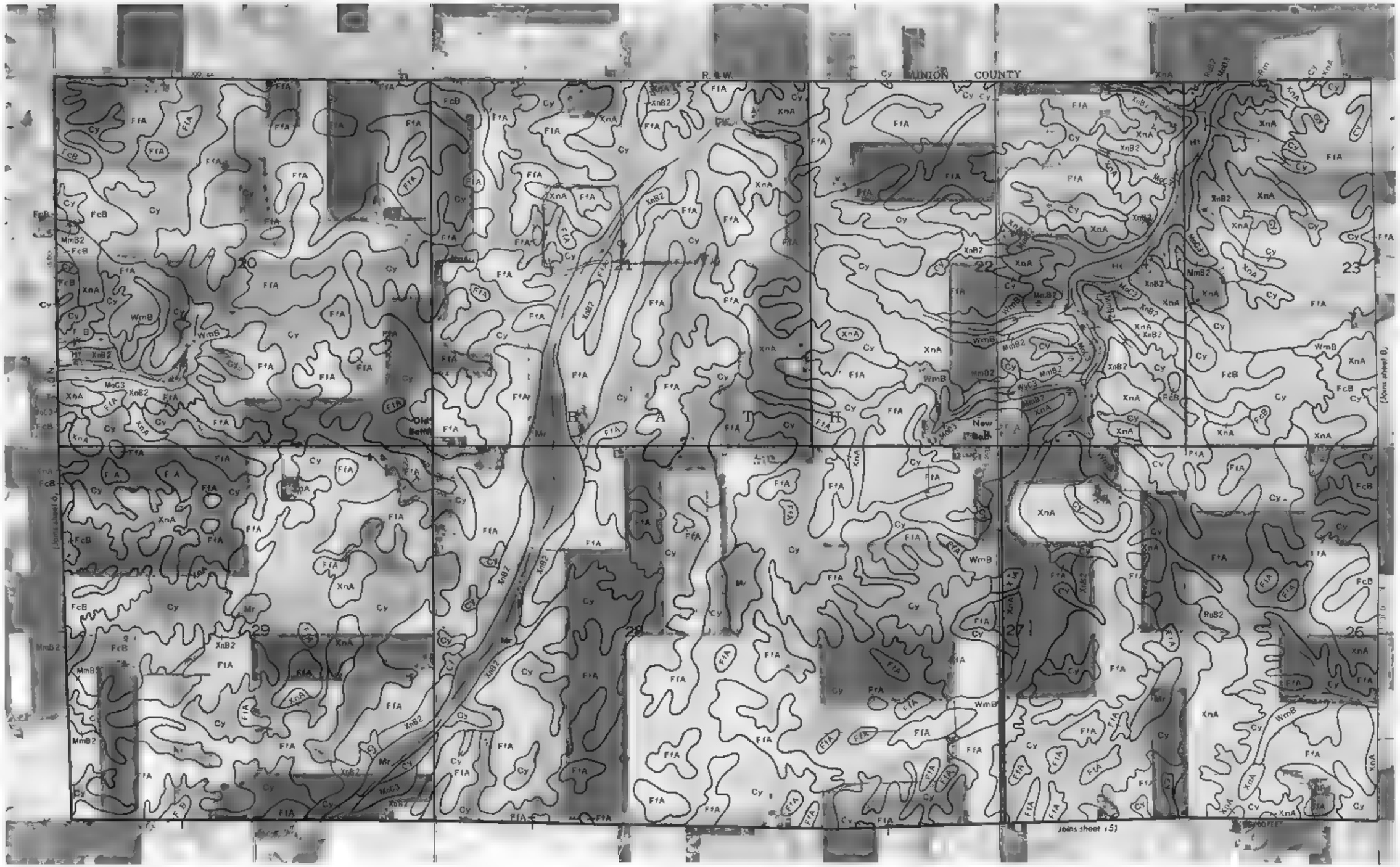
1 Mile

5 000 Feet

New Fairfield

Towns 3 | Towns sheet 1 of 7

FRANKLIN COUNTY INDIANA NO 6



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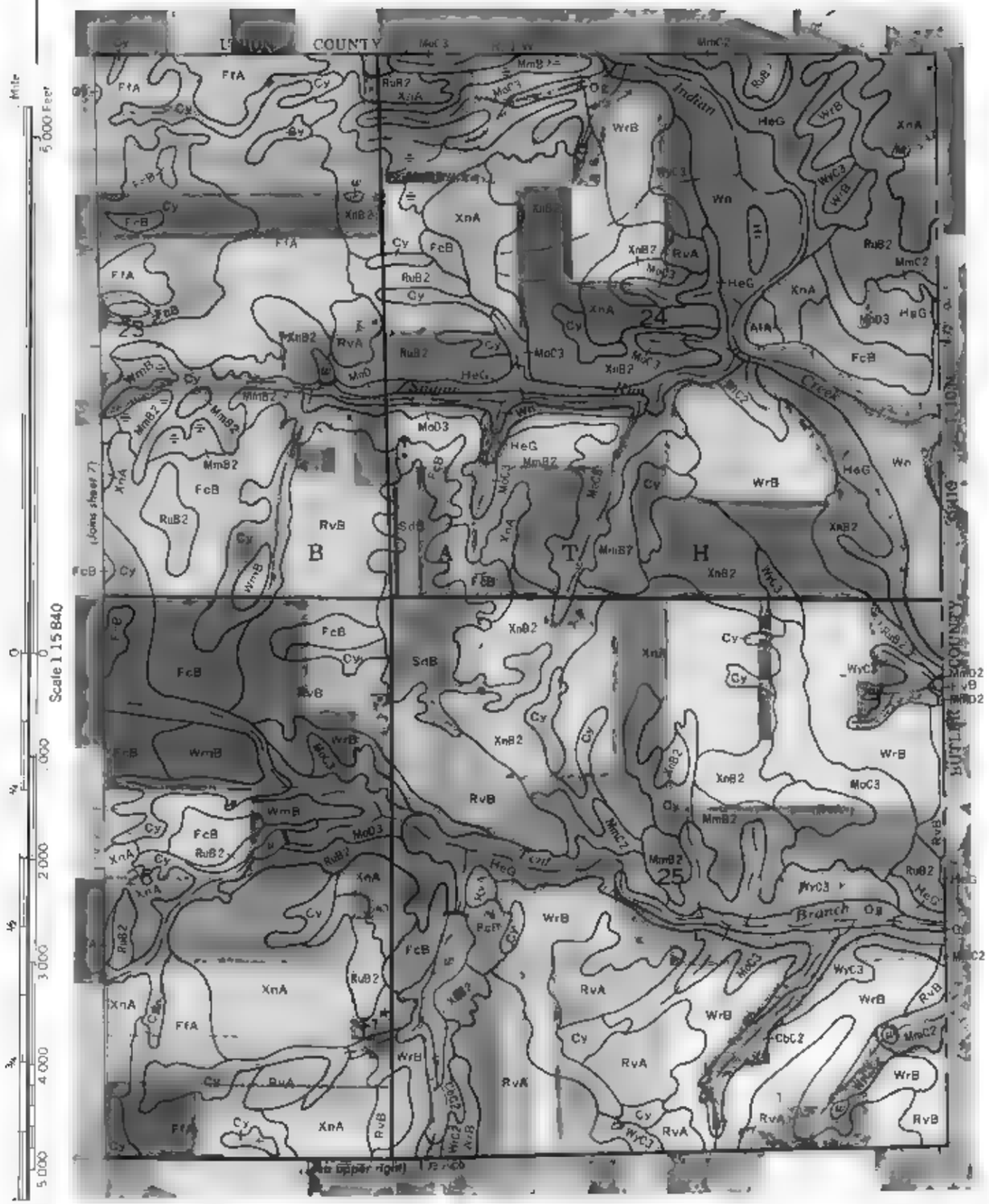

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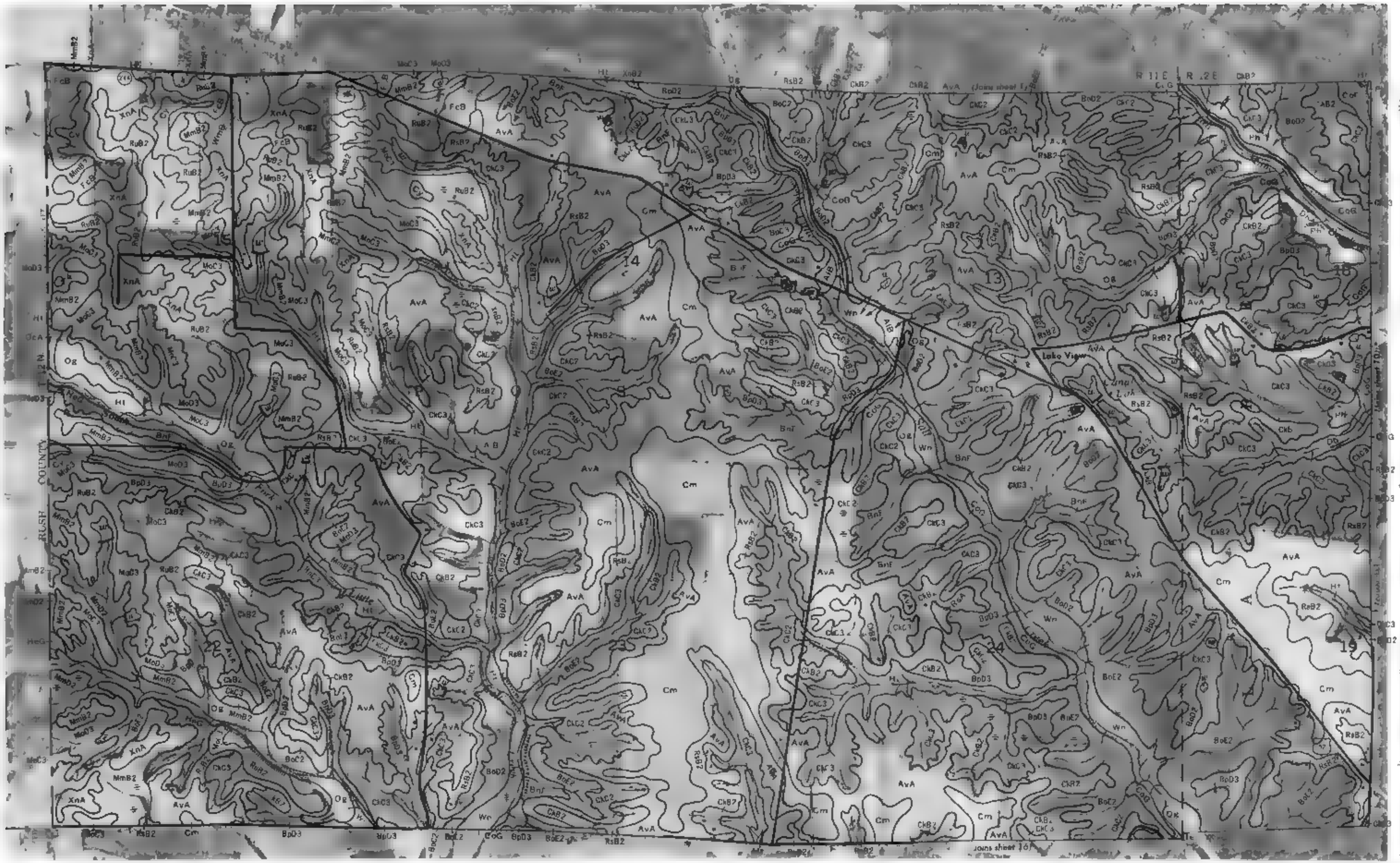


FRANKLIN COUNTY INDIANA NO 9

FRANKLIN COUNTY INDIANA NO .0

FRANKLIN COUNTY, INDIANA NO. 11

12

N

Scale 1:15,840

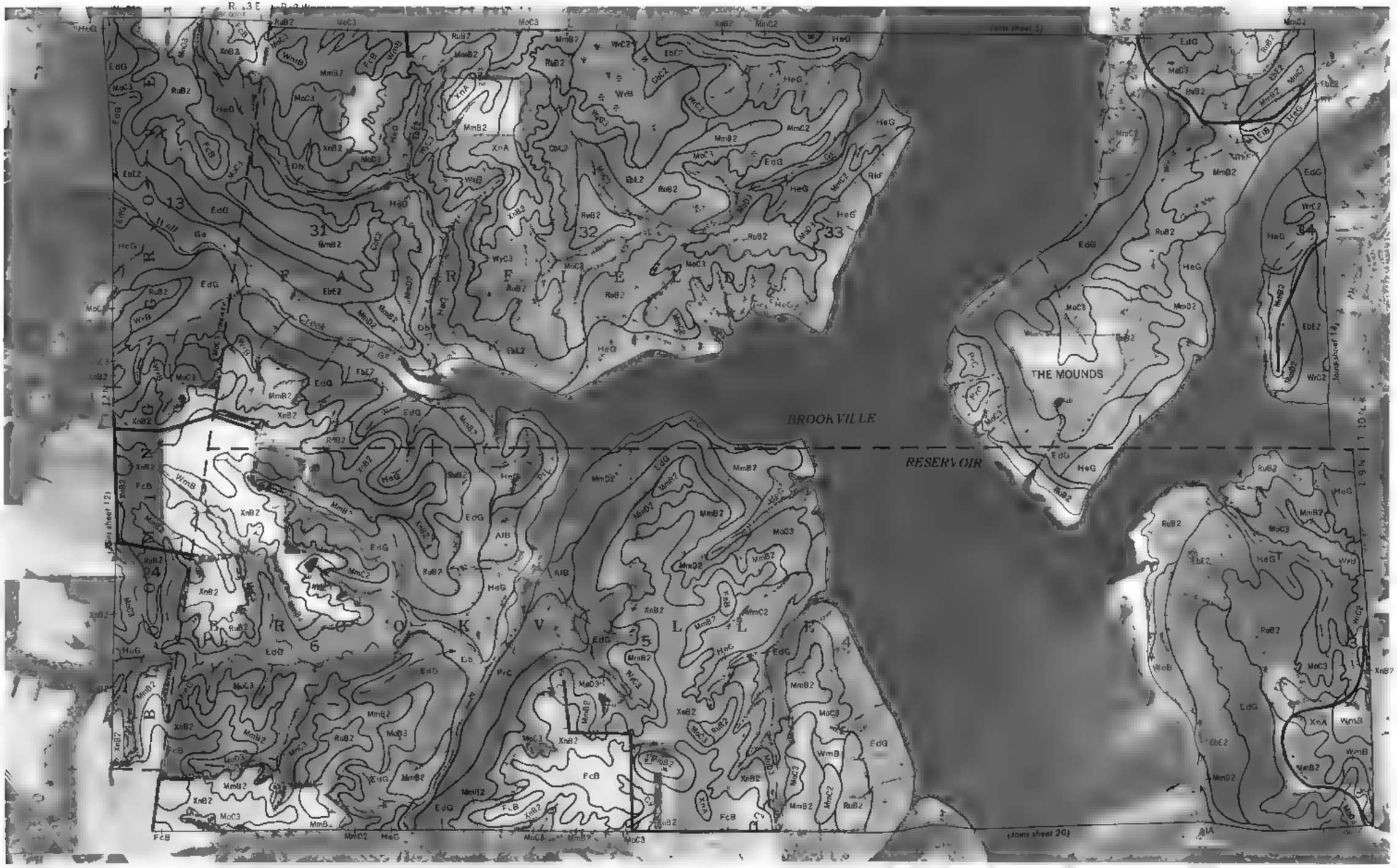
0 5,000 Feet

0 1,000 2,000 3,000 4,000 5,000

R 13 E

T 12 N

FRANKLIN COUNTY INDIANA NO 12



FRANKLIN COUNTY INDIANA NO 13

14

N

Mile

5,000 Feet

0 Scale 1:15,840

1/4 1,000

1/2 2,000

3/4 3,000

1 4,000

1 1/4 5,000

R 1 W

R 1 E

T 10 N

T 9 N

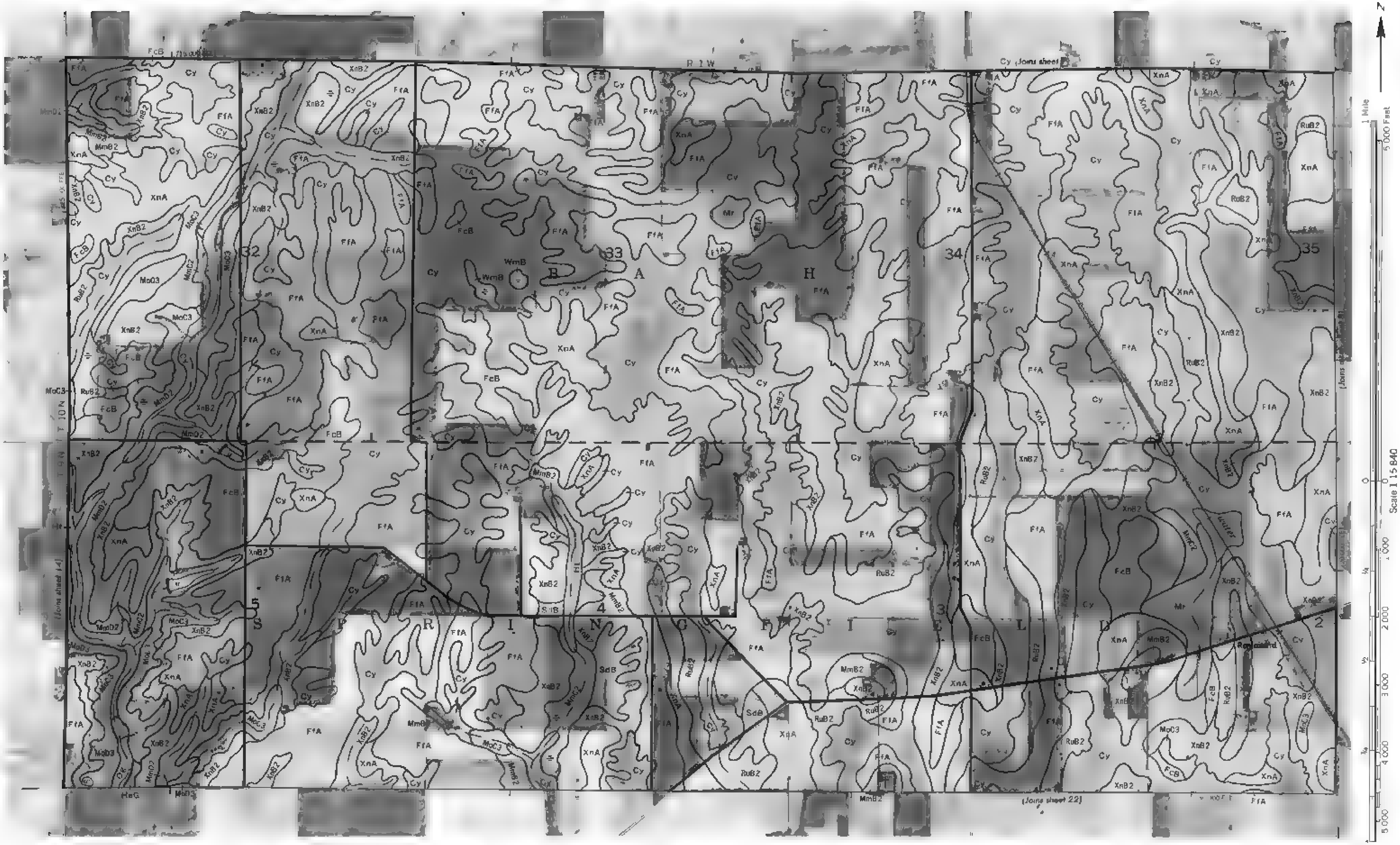
BROOKVILLE RESERVOIR

(Joins sheet 6)

(Joins sheet 21)

(Joins sheet 5)

FRANKLIN COUNTY INDIANA NO 14



FRANKLIN COUNTY INDIANA NO. 15


N
Scale 1:15 840
(Joins sheet 9)
(Joins sheet 17)
Joins sheet 24
Joins 25
R 12 E
T 12 N
Buena Vista
AvA
Cm

FRANKLIN CO., INDIANA NO. 17

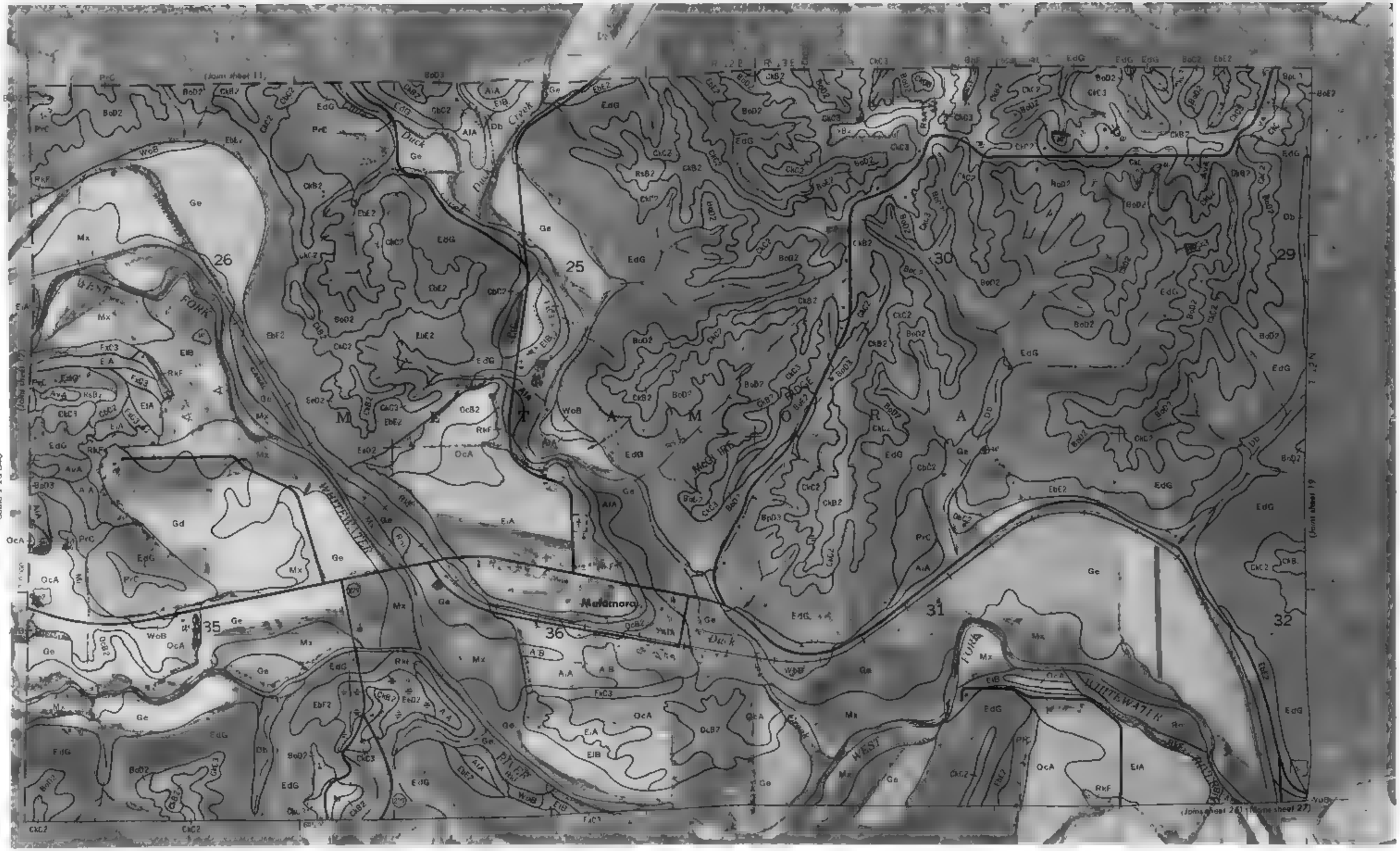
18

N

Scale 1:15 840

Meters 0 500 1 000 2 000 3 000 4 000 5 000

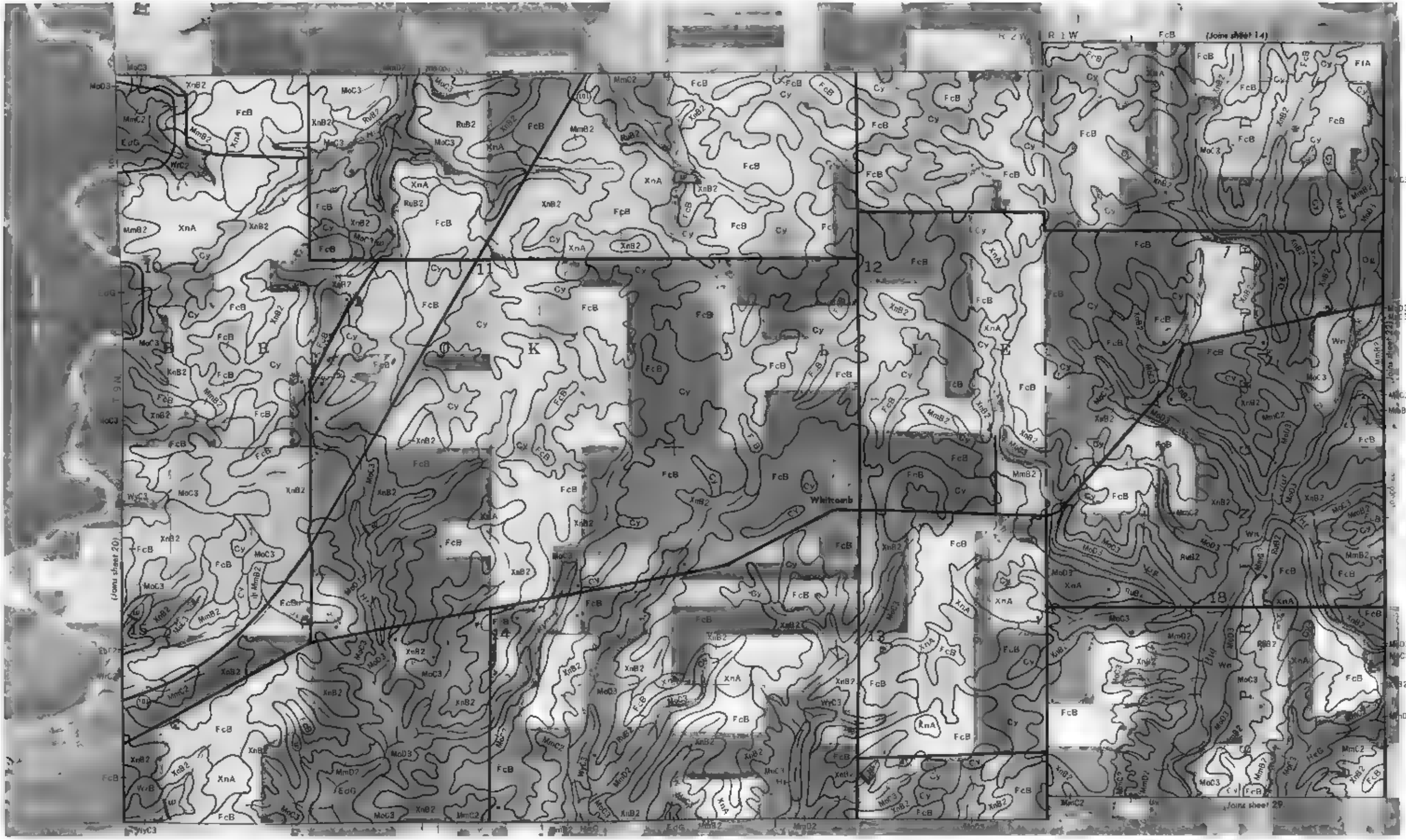
Feet 0 1 000 2 000 3 000 4 000 5 000



INDIANA NO. 18
FRANKLIN COUNTY INDIANA

FRANKLIN COUNTY, INDIANA NO. 19

FRANKLIN COUNTY INDIANA NO 20



22

N

Scale 1:15 840

(Joins sheet 15)

(Joins sheet 21)

(Joins sheet 30)

(Joins sheet 23)

T 9 N

R 1 W

8 9 10 11 12 13 14 15 16 17

FRANKLIN COUNTY INDIANA NO 22

FRANKLIN COUNTY INDIANA NO 23

INSET

SPRINGFIELD

(Joins sheet 22)

(Joins upper right)

(Joins sheet 30)

(Joins sheet 38)

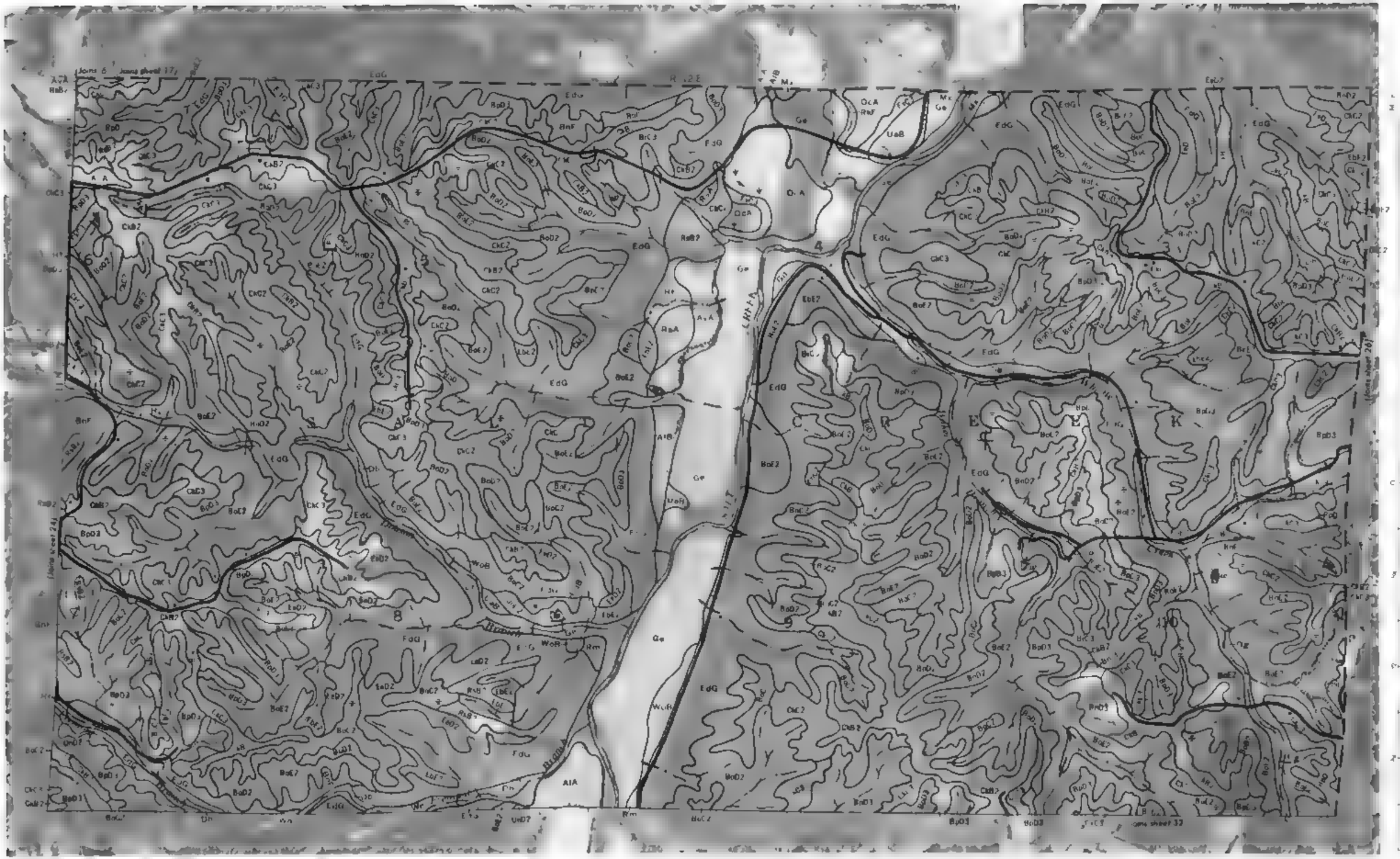
BUTLER COUNTY, OHIO

HAMILTON COUNTY, OHIO

Scale 1 : 15 840

5,000 Feet

FRANKLIN COUNTY INDIANA NO. 24



26

N

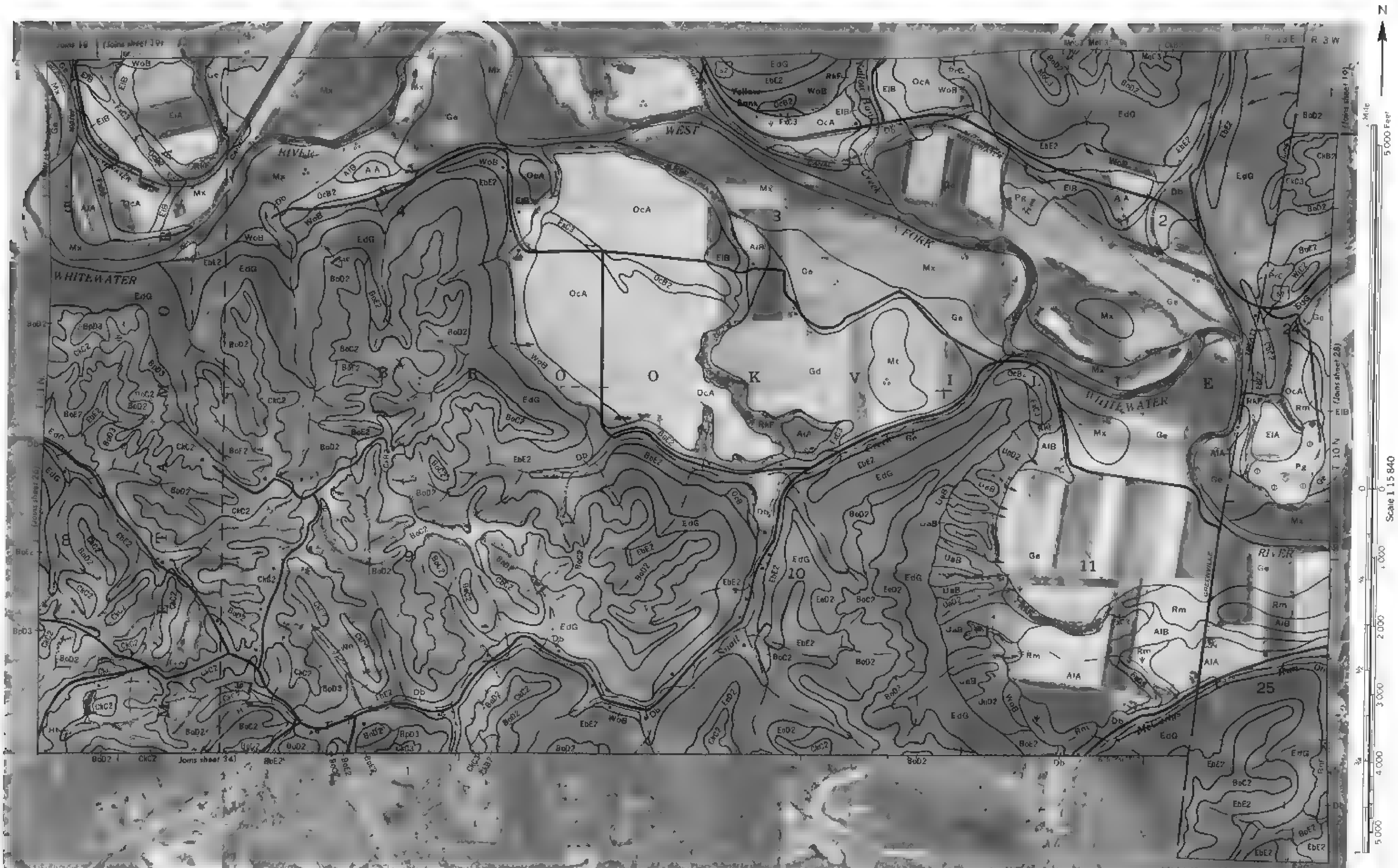
1 Mile

5,000 Feet

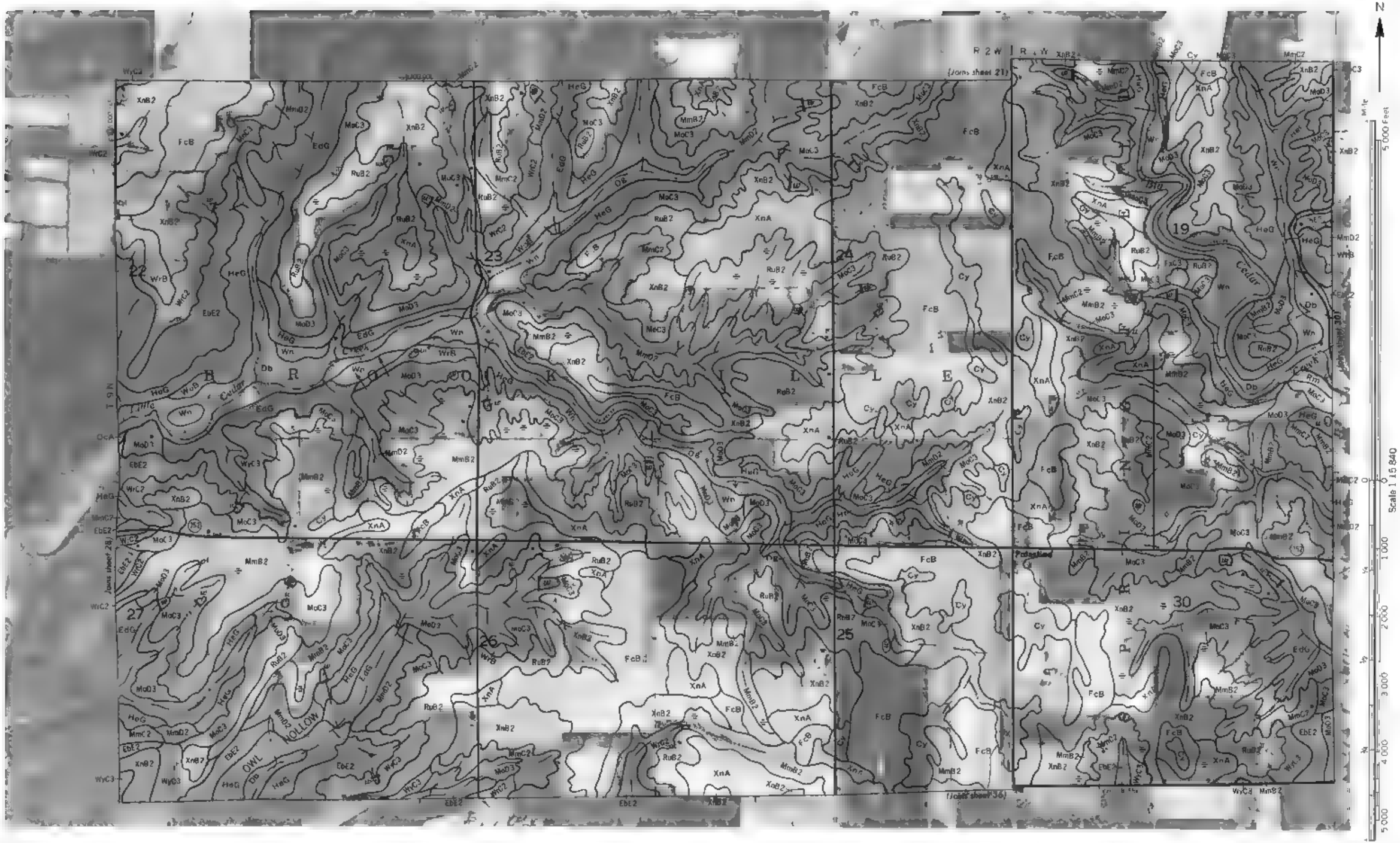
Scale 1:15,840

FRANKLIN COUNTY NO 26

27


N
WHITEWATER
WEST
FORK
WHITEWATER
RIVER
CANAL
(Joins sheet 19)
(Joins sheet 28)
(Joins sheet 26)
Joins sheet 34
T 10 N
R 3 W
OcA
Mx
Ge
Gd
Mt
EdG
BoD2
EbE2
ChC2
WoB
EIA
EIB
AIA
AIB
Rm
Pg
Db
UaB
3
2
4
5
8
9
10
11
24
25
1
Scale 1:15 840
5 000 Feet
1 Mile

FRANKLIN COUNTY INDIANA NO 28



FRANKLIN COUNTY INDIANA NO. 29

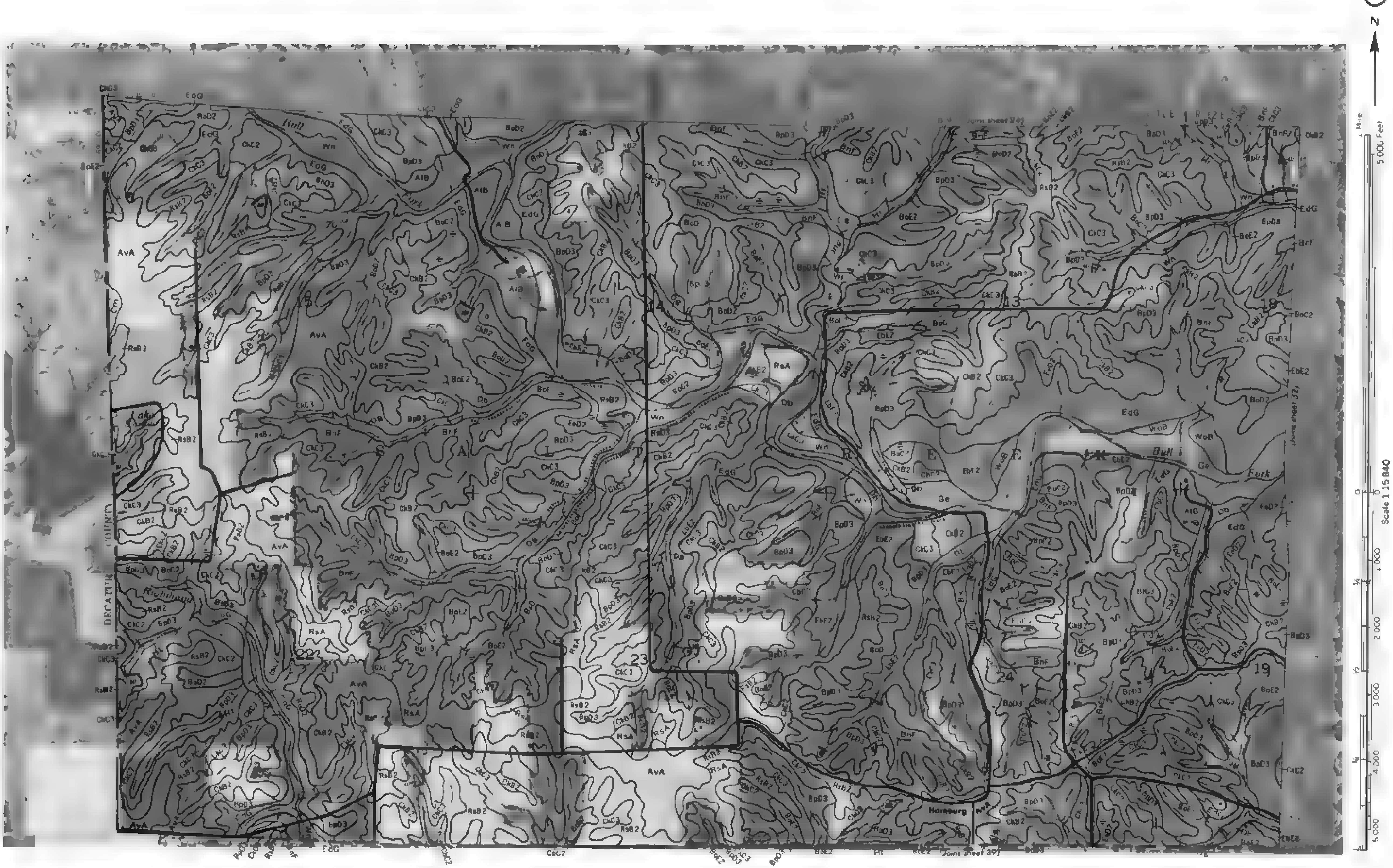
30

N

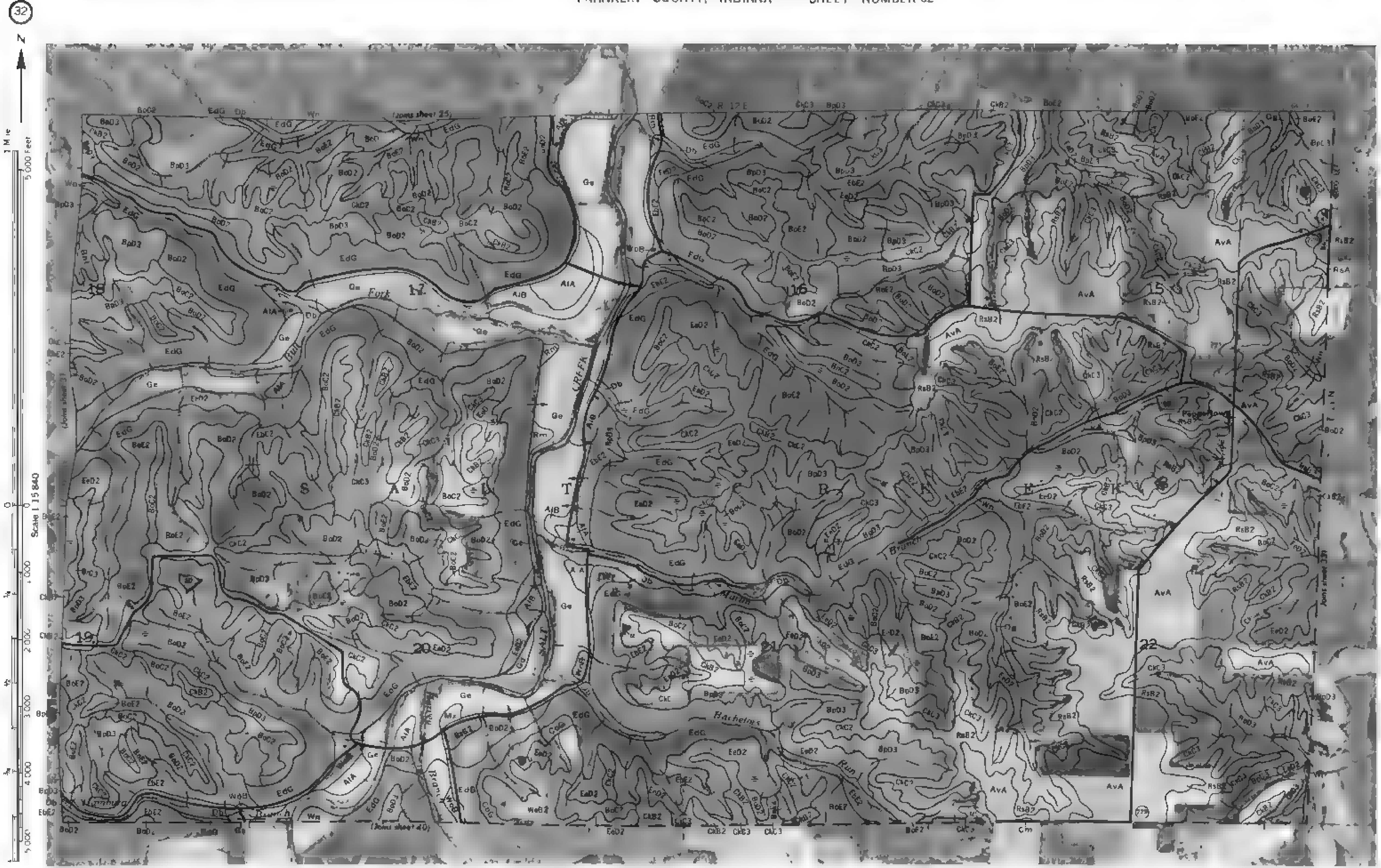
Scale 1:15 840

Mount Carmel

FRANKLIN COUNTY INDIANA NO 30



FRANKLIN COUNTY, INDIANA NO. 31

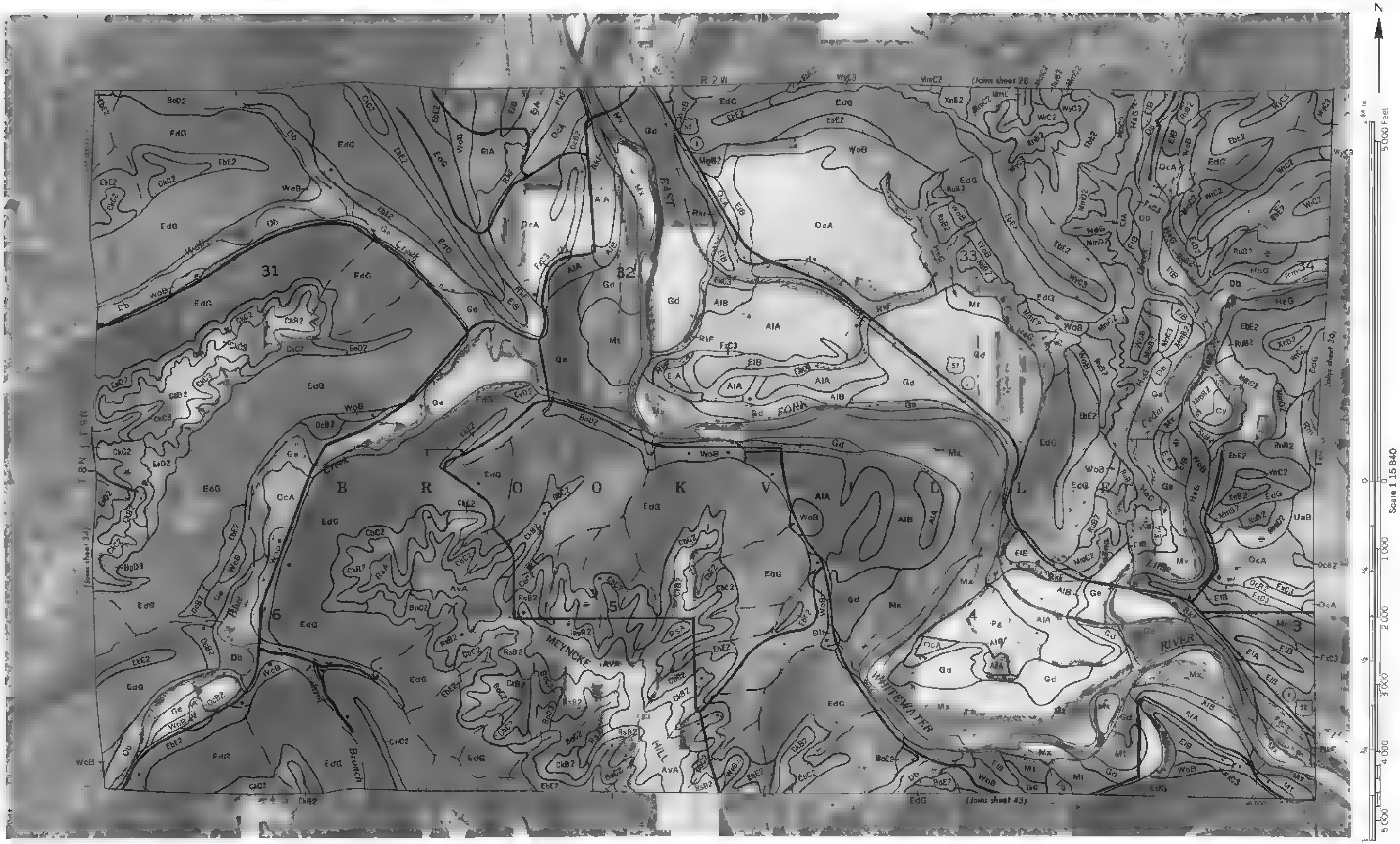

32
N
1 Mile
5 000 Feet
Scale 1:15 840
(Joins sheet 25)
(Joins sheet 40)
(Joins sheet 31)
(Joins sheet 33)
R. 12 E.
T. 11 N.
Fork
Bull
Branch
Run
Bachelors
CREEK
SALT
Pipe Creek
18
17
16
15
19
20
21
22
S
A
L
T
C
R
E
K

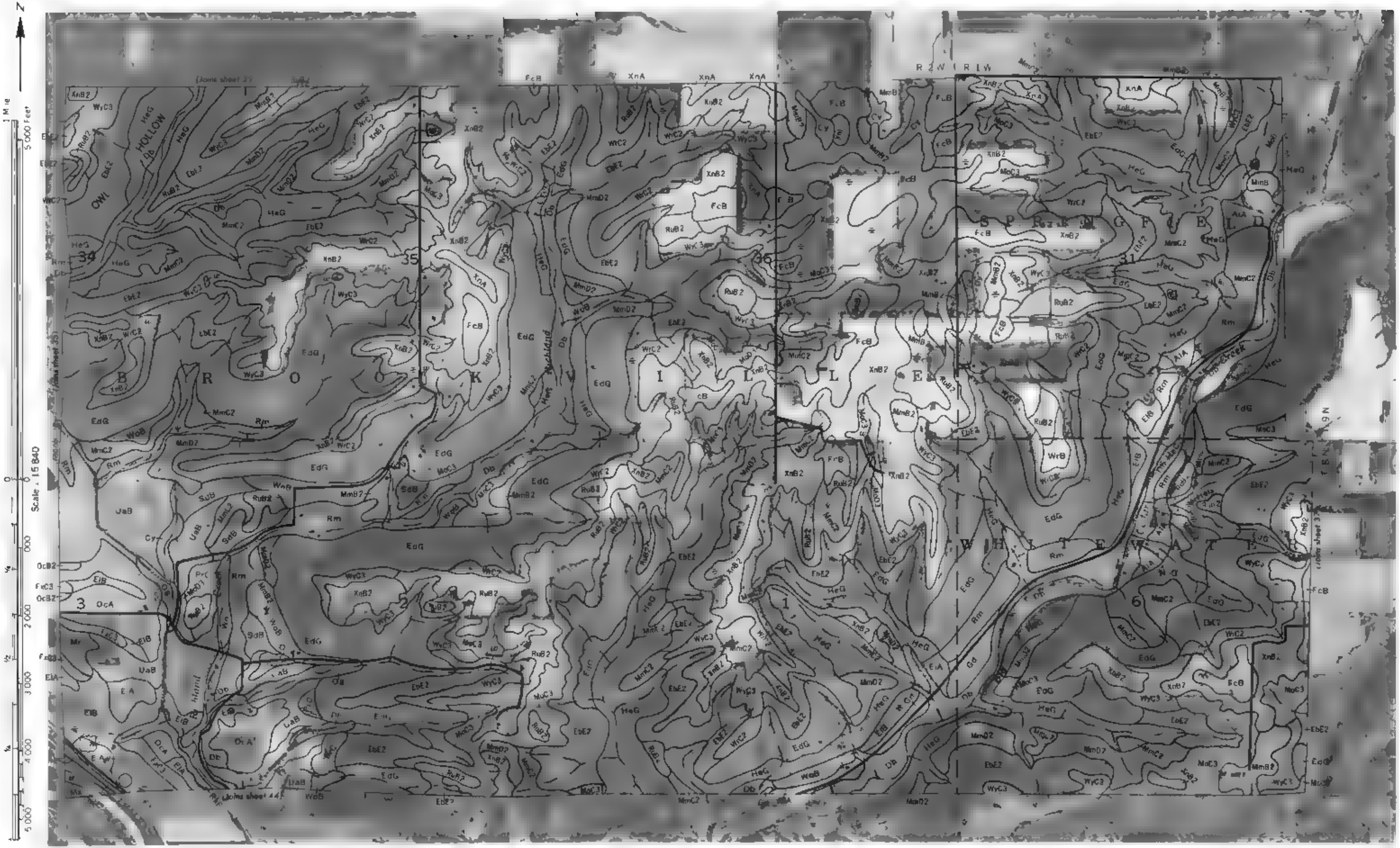
FRANKLIN COUNTY IND ANA NO 33

Part was compiled on 1970 and 1976 aerial photographs by the U.S. Department of Agriculture Soil Conservation Service and cooperating agencies
Cooperators and land-division corners on all sheets are approximately positioned

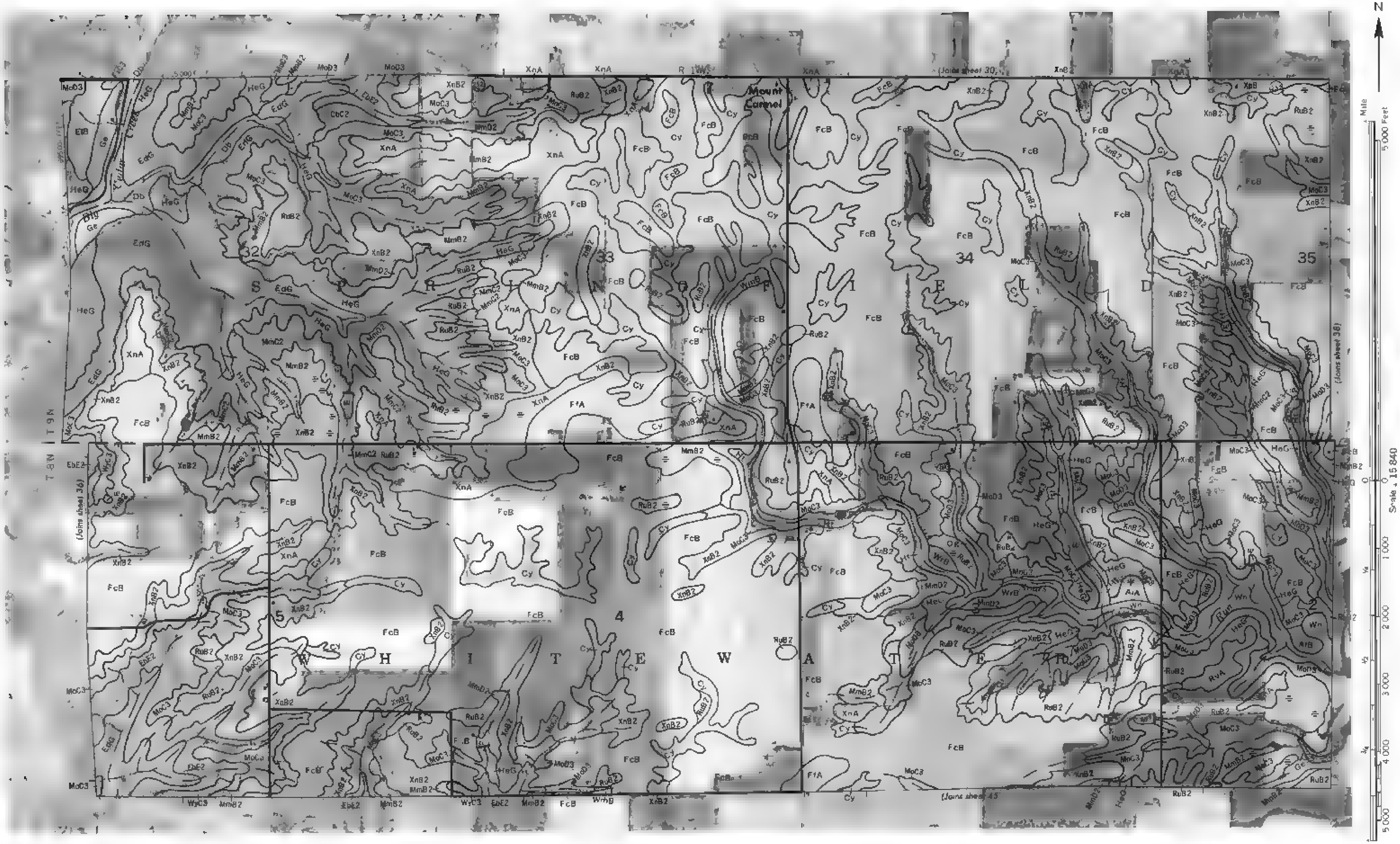
FRANKLIN COUNTY INDIANA NO 34

FRANKLIN COUNTY, INDIANA NO. 35





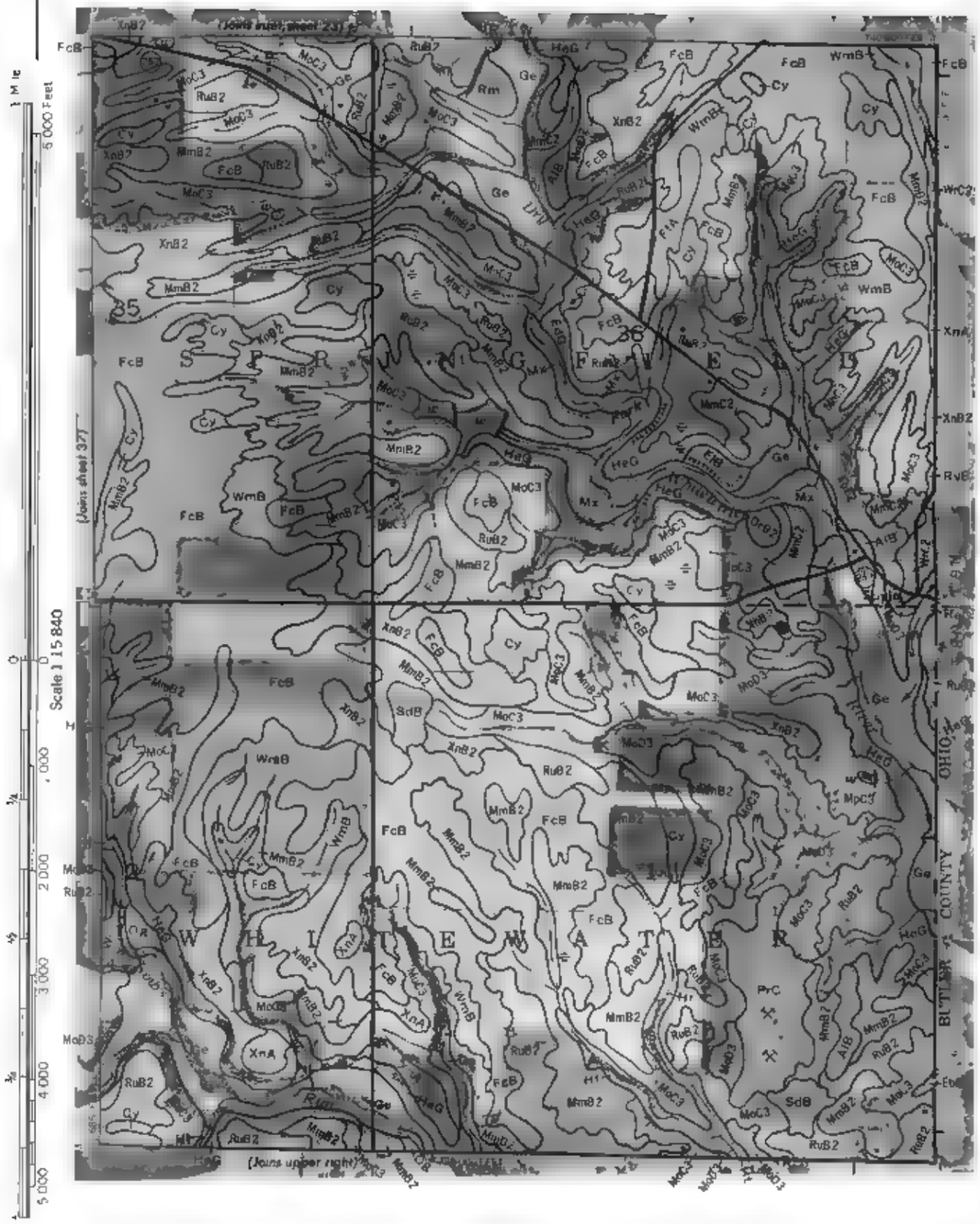
FRANKLIN COUNTY INDIANA NO 36


N
Mount Carmel
(Joins sheet 30)
(Joins sheet 38)
(Joins sheet 36)
(Joins sheet 45)
R 1 W
T 9 N
T 8 N
32
33
34
35
5
4
S P R I N G F I E L D
W H I T E W A T E R
Scale 1:15 840
1 Mile
5 000 Feet

38

N

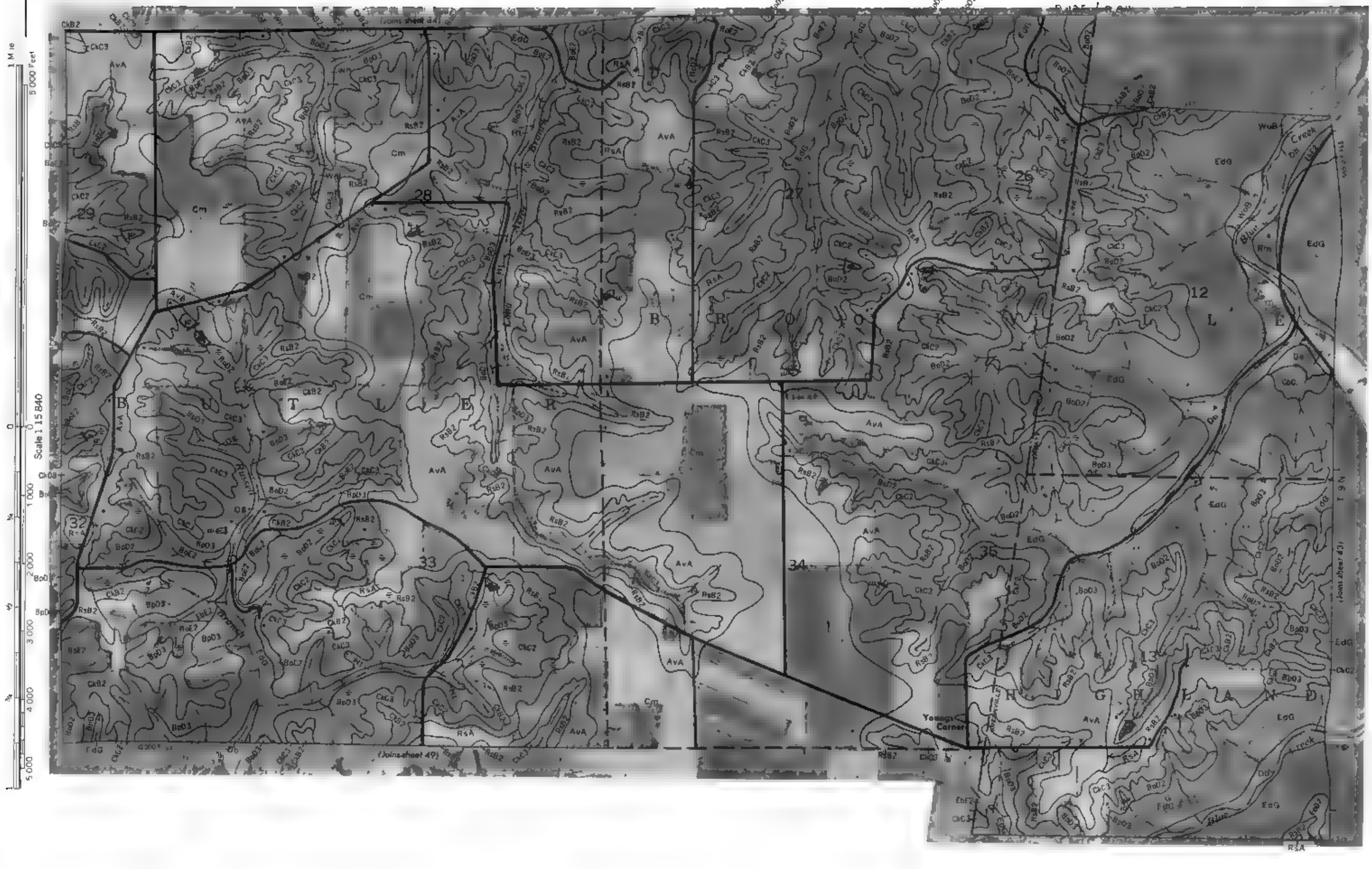
INSET



FRANKLIN COUNTY INDIANA NO 38

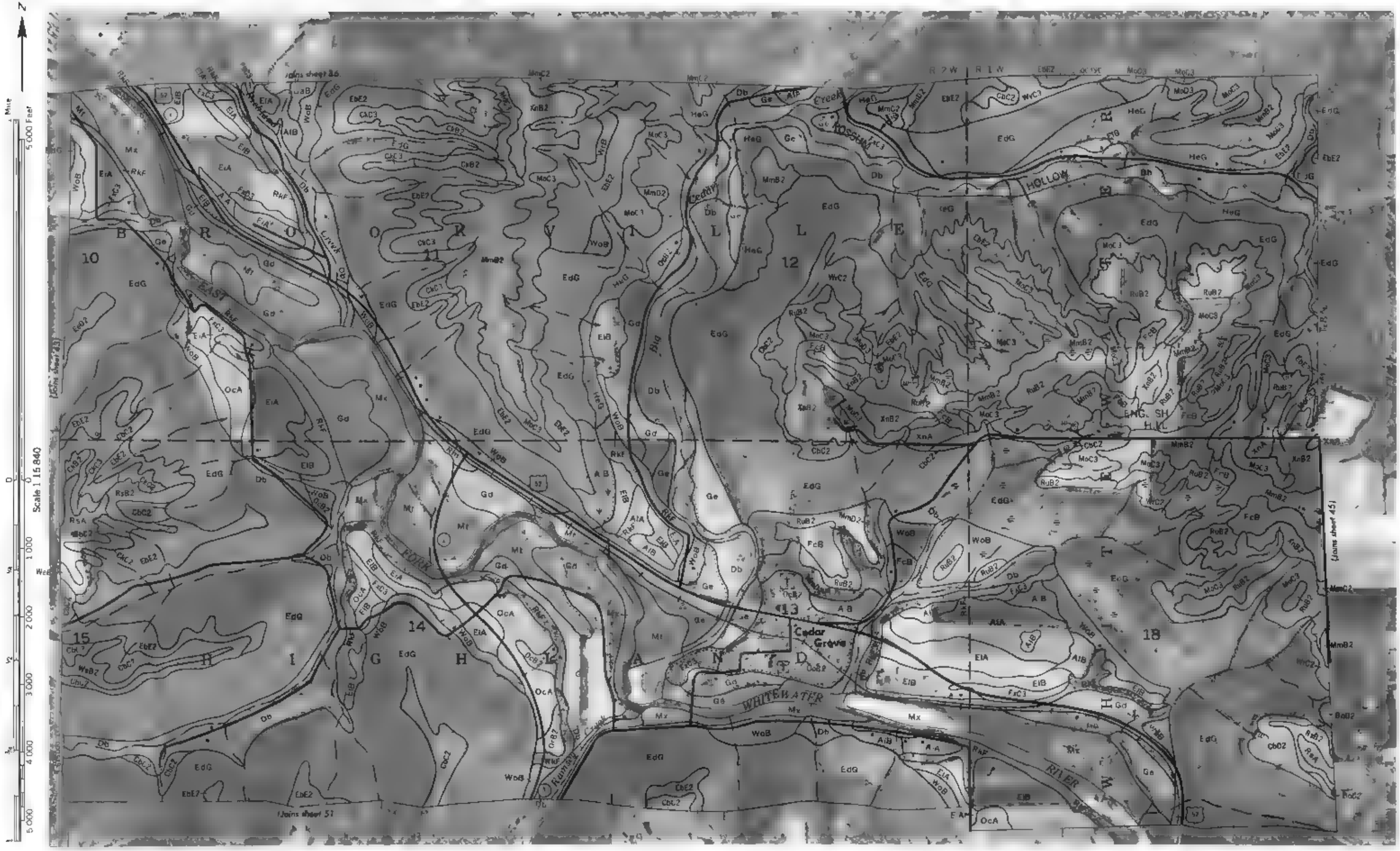
FRANKLIN COUNTY INDIANA NO 40

FRANKLIN COUNTY, INDIANA NO. 41

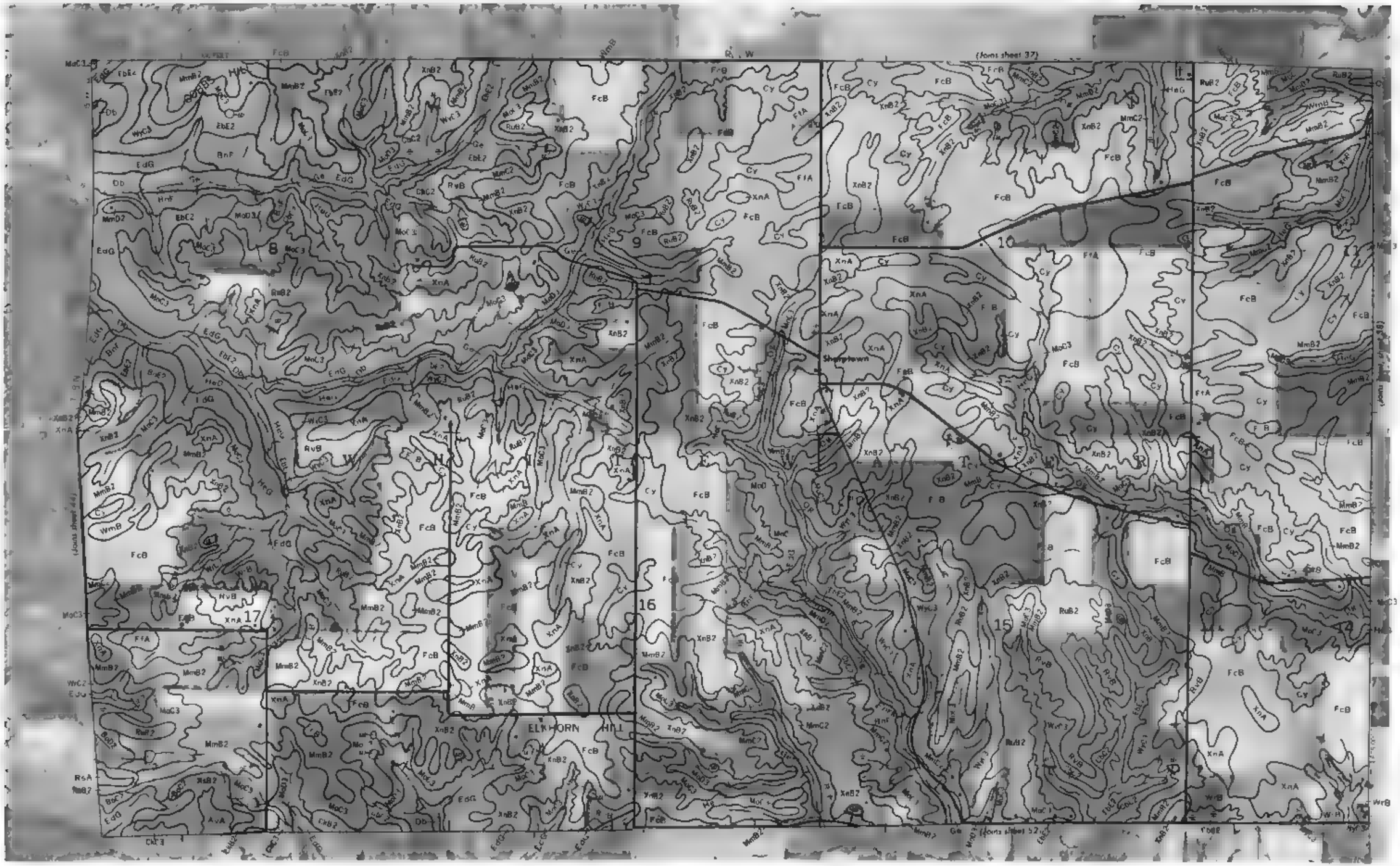


FRANKLIN COUNTY INDIANA NO 42

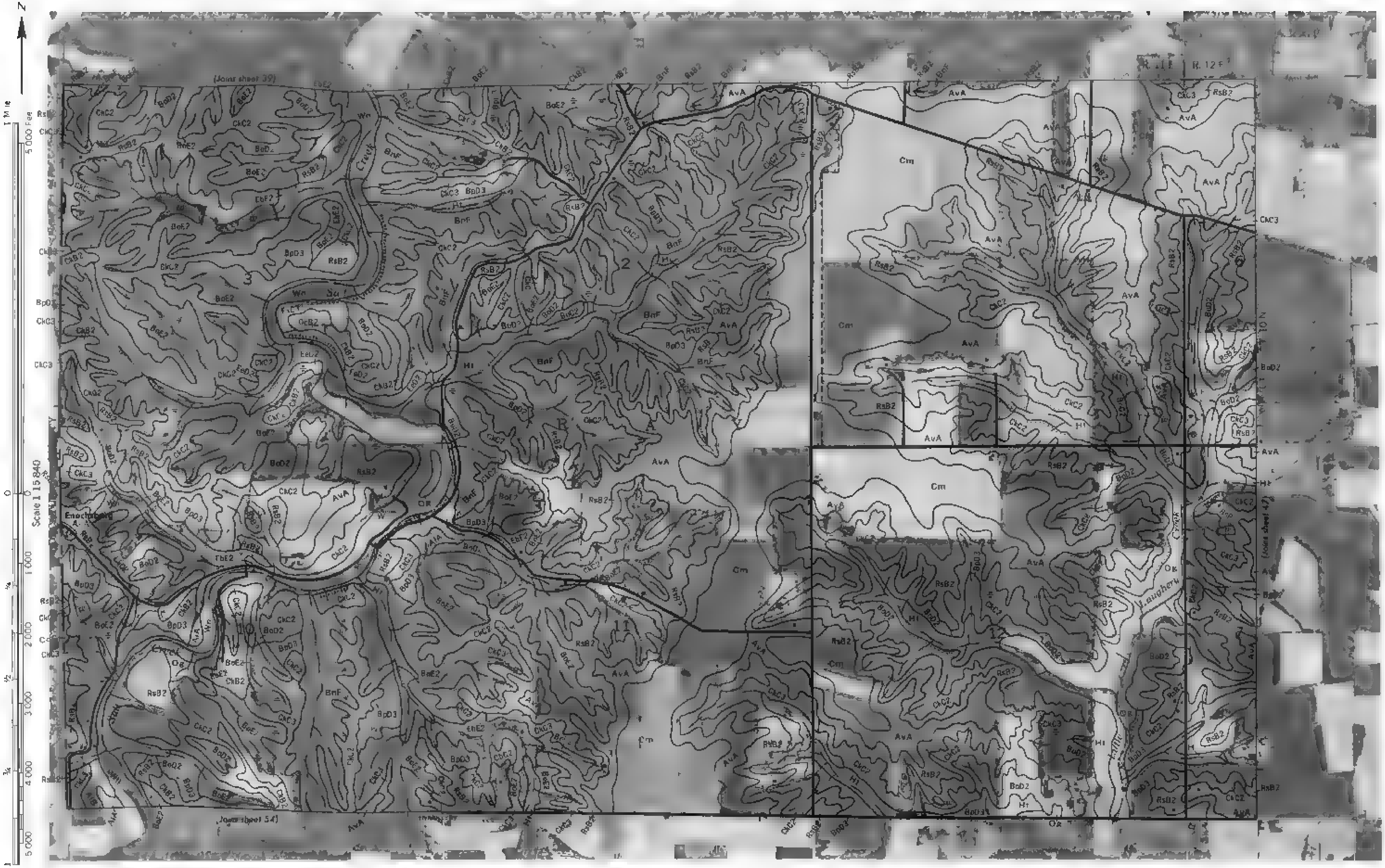
FRANKLIN COUNTY INDIANA NO 43



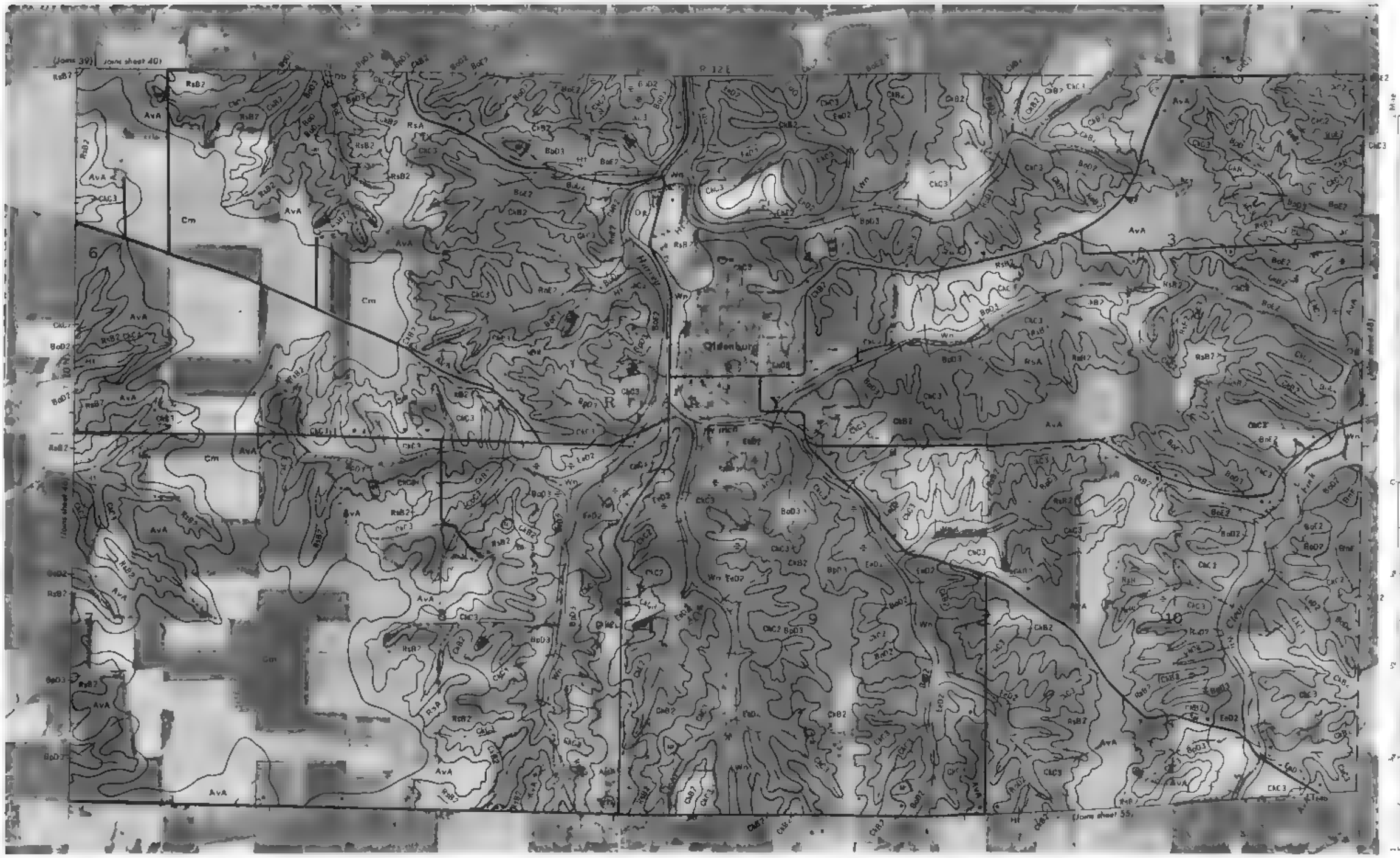
FRANKLIN COUNTY INDIANA NO 44

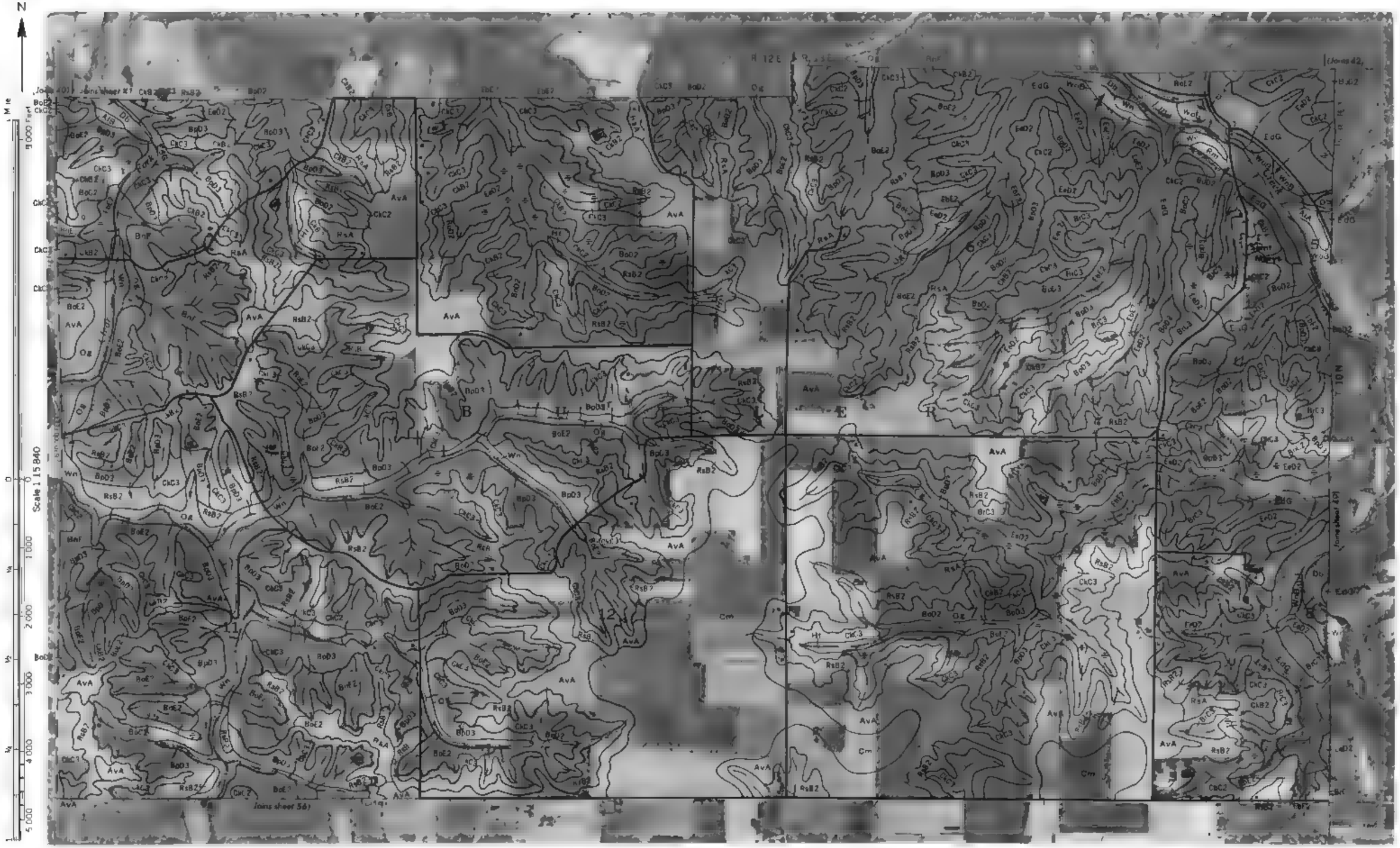


FRANKLIN COUNTY INDIANA NO 45



FRANKLIN COUNTY INDIANA NO. 46





FRANKLIN COUNTY, INDIANA NO 48

FRANKLIN COUNTY INDIANA NO 49

N

Scale 1:15840

50

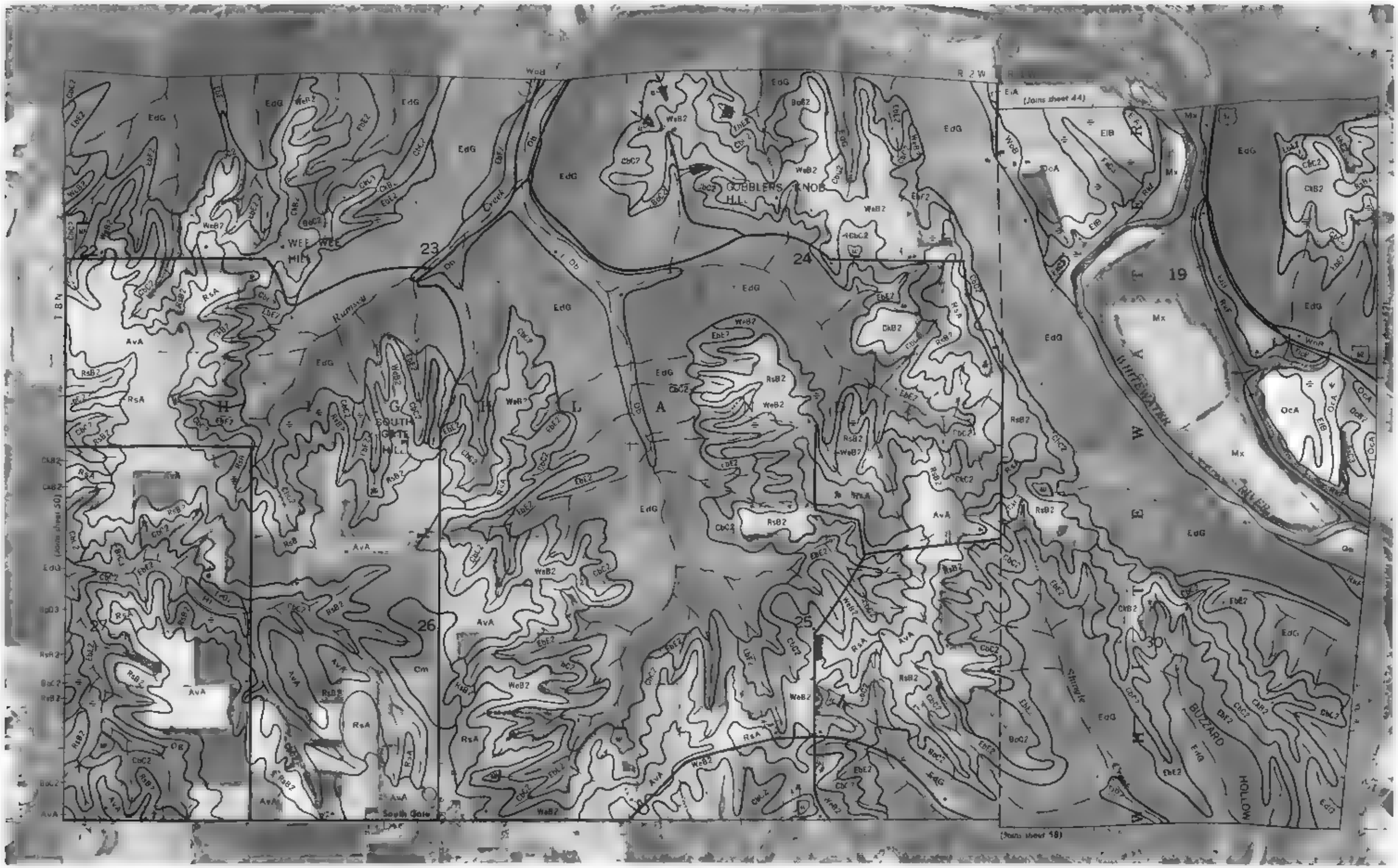
N

Scale 1:15,840

0 ¼ ½ 1 Mile

0 1,000 2,000 3,000 4,000 5,000 Feet

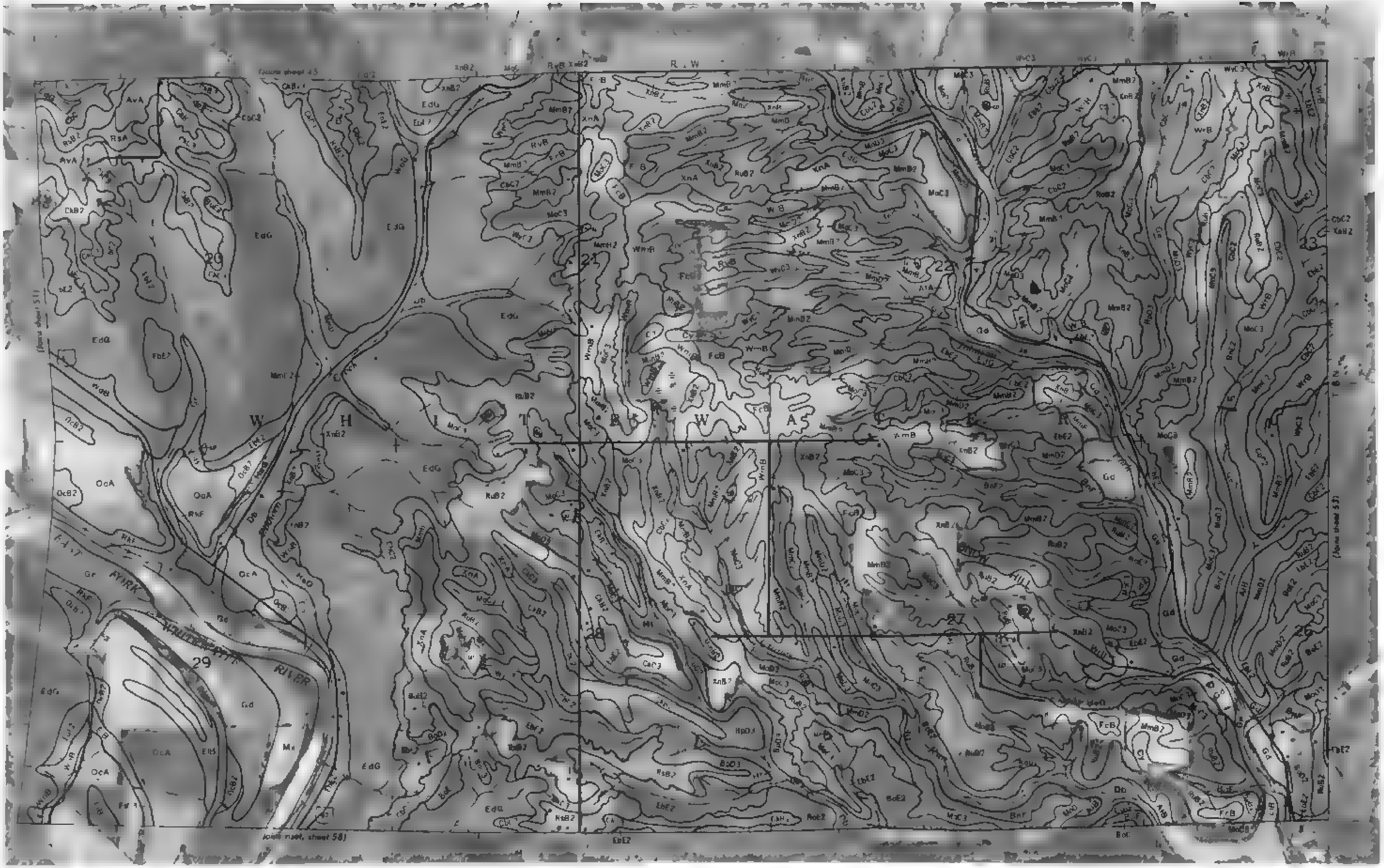
FRANKLIN COUNTY INDIANA NO 50



FRANKLIN COUNTY INDIANA NO 51

N

Scale 1:15 840



FRANKLIN COUNTY INDIANA NO 53

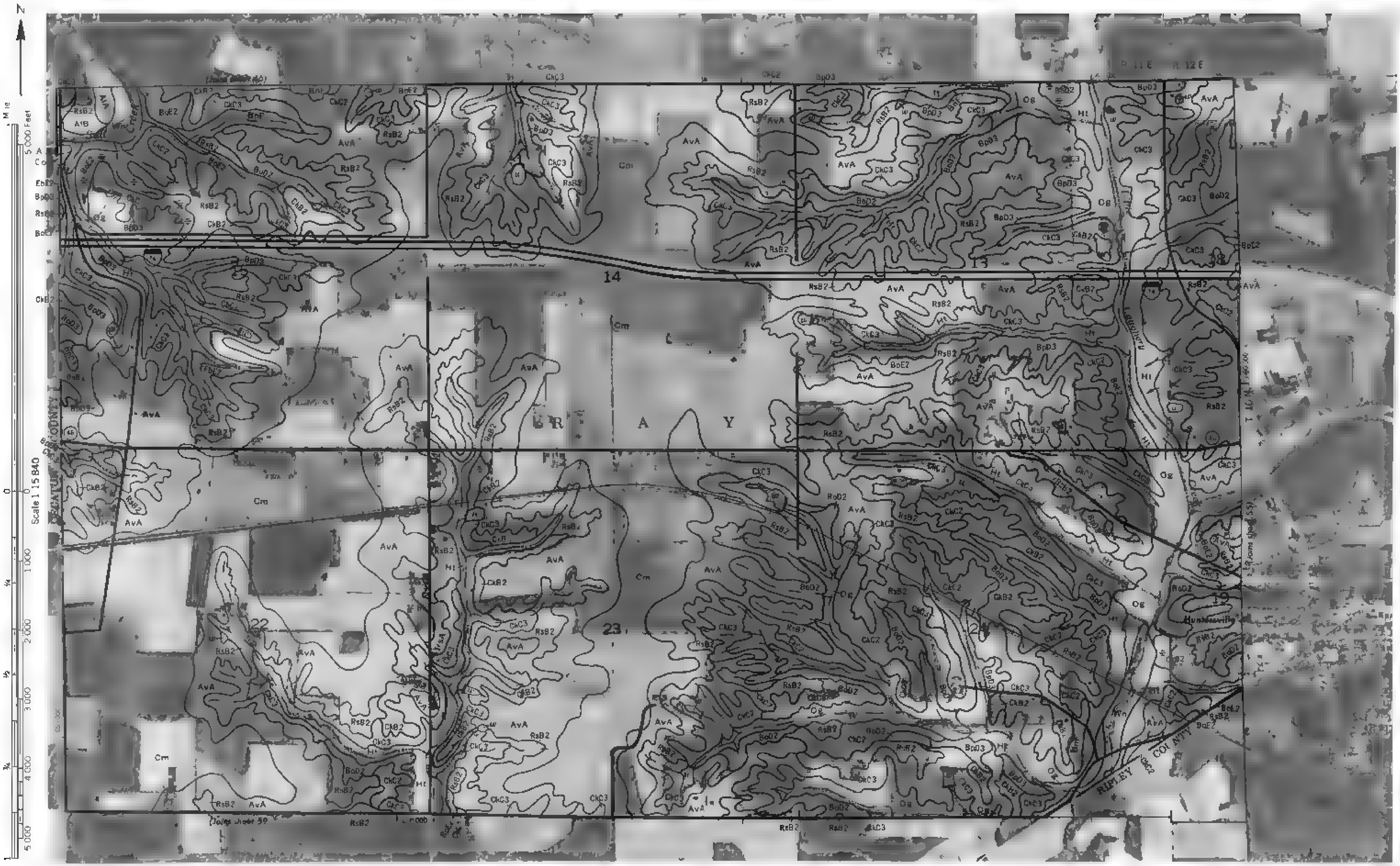
53

N

1 Mile 5,000 Feet

Scale 1:15,840

0 0 ¼ 1,000 ½ 2,000 ¾ 3,000 1 4,000 5,000


N
Scale 1:15 840
GRAY
14
13
23
RIPLEY COUNTY
DECATUR COUNTY
Huntersville
R 11 E
R 12 E
AvA
Cm
RsB2
CkC3
BoD2
Og
Ht

FRANKLIN COUNTY INDIANA NO 55

FRANKLIN COUNTY, INDIANA — SHEET NUMBER 56

INSET

N

1 Mile
5 000 Feet
Scale 1:15 840

3000 AND 5000-FOOT GRID TICKS

This map is compiled on 1975 and 1976 aerial photography by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

FRANKLIN COUNTY, INDIANA NO. 57

This map is compiled on 1975 and 1976 aerial photographs by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Coordinate grid ticks and land division corners, if shown, are approximately positioned.

57

N

1 Mile

5 000 Feet

Scale 1:15 840

58

N

1 Mile

5 000 Feet

Scale 1:15 840

0 ¼ ½ ¾ 1

1 000 2 000 3 000 4 000 5 000

INSET

This map is compiled on 1975 and 1976 aerial photographs by the U. S. Department of Agriculture, Soil Conservation Service and cooperating agencies.
Soil boundaries, identified by symbols, are approximately positioned.
Coordinate grid ticks and land survey corners, if shown, are approximately positioned.

FRANKLIN COUNTY, INDIANA NO. 58

FRANKLIN COUNTY, INDIANA NO. 59

This map is compiled on 1970 and 1975 aerial photographs by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Coordinate grid ticks and land division corners, if shown, are approximately positioned.